IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Nestor Kolcio
Serial No.	:	09/954,788
Filed:	:	September 18, 2001
For:	:	Method for Accessing Electrical Components with Gloved Hands
TC/AU	:	3765
Examiner	:	Katherine M. Moran
Attorney Docket No.	:	UPI 2-001

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APPELLANTS' BRIEF ON APPEAL

Sir:

Responsive to a Communication mailed May 9, 2003, submitted herewith in triplicate is Appellant's Brief on Appeal as prescribed in 37 C.F.R. § 1.192. Reversal of the primary examiner's rejection of the appealed claims and their allowance is respectfully requested.

The requisite fee of $165.00 as required in 37 C.F.R. § 1.17(c) is submitted herewith. Any additional payments that may be required should be charged to Deposit Account No. 13-4830.

Respectfully submitted,

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CERTIFICATE OF MAILING

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Jane Keeney

Jane Keeney

Real Party in Interest

The appealed application has not been assigned by Appellant and currently is owned by Nestor Kolcio.

Related Appeals and Interferences

There are no related appeals or interferences known to appellant, his legal representatives, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

14 claims were submitted with the application as originally filed.

An Office Action was mailed on June 27, 2002 rejecting claims 1-14 under 35 U.S.C. § 112 as being indefinite and under 35 U.S.C. § 103 as being obvious in view of U.S. Patent Nos. 4,536,890 and 3,883,899. In an amendment dated September 24, 2002, claims 1, 2, 8, and 9 were amended. A declaration under 37 C.F.R. 1.132 was submitted with the amendment.

In a subsequent Office Action mailed December 6, 2002, claims 1-14 were rejected under 35 U.S.C. § 103 as being obvious in view of French Patent FR 2,448,307; U.S. Published Application U.S. 2002/0075232; and U.S. Patent No. 4,536,890. In a response dated March 5, 2003, claims 1 and 8 were amended. A second Declaration under 37 C.F.R. 1.132 was submitted with Appellant's response.

In the Office Action mailed May 9, 2003, claims 1-14 were again rejected and the action was made final. The claims were rejected under 35 U.S.C. § 103 as being obvious in view of French Patent FR 2,448,307; U.S. Published Application U.S. 2002/0075232; U.S. Patent No. 3,761,965; and U.S. Patent No. 4,536,890.

Appellant filed a Notice of Appeal and a three month extension of time request on November 7, 2003.

Status of Amendments

All of the amendments submitted by Appellants have been entered.

Summary of the Invention

The invention is directed to a method for accessing electrical components energized at voltages of about 1000 volts rms and below. At such specified lower voltage ranges, a rubber-type insulating glove may be utilized without an outer leather protector glove or other protective layer. In fact, for relatively low voltage environments, it is important that an electrician have sufficient dexterity to manipulate small electrical system components, such as washers, bolts, nuts and the like. One of the problems associated with electrically protective gloves is sweat-based moisture buildup that occurs quickly when wearing such a glove. Appellant recognized that, rather than trying to make a glove that was cooler and could be worn longer, it was important that the glove be easy to take on and off. Appellant also recognized that making a glove easy to put on and take off could be achieved by providing a flocking layer. However, a flocking layer on the entire interior of the glove unacceptably diminishes the electrician's dexterity. To solve the problems of making a glove easy to take on and off but providing sufficiently dexterity, Appellant conceived of lining the interior of a glove, for example, on only the palm and back of the hand, with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions. Thus, the glove simultaneously provides electrical protection and the necessary dexterity to manipulate small components, but is still be easy to remove.

Using the present method, these advantages may be realized with a Class 00 or Class 0 glove meeting the ASTM Standard Specification for Rubber Insulating Gloves. The flock lined gloves may be formed simply by spraying non-conducting adhesive born flock through the cuff opening of an unreversed Class 00 and/or Class 0 glove. Using this technique, the flocking will diminish from the bases of the finger sheaths to be substantially absent at the fingertip regions. It is desired that flocking be completely absent from the fingertip regions, but, because the spraying of adhesive born flock is not an exact science, some minor flocking may be present in the fingertip regions. A glove having some flocking in the fingertip regions would still be within the teachings of the precept of the invention so long as the it does not interfere with the stated purpose of providing manual dexterity for the wearer.

Summary of the Rejection

Claims 1-6 and 8-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over French Patent FR 2,448,307 issued to Hutchinson-Mapa in view of U.S. Published Application U.S. 2002/0075232 applied for by Daum and U.S. Patent No. 3,761,965 issued to Barasch.

Claims 7 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hutchinson-Mapa in view of Daum and Barasch and in further view of U.S. Patent No. U.S. Patent No. 4,536,890 issued to Barnett.

Issues

1. Are claims 1-6 and 8-13 obvious over French Patent FR 2,448,307 issued to Hutchinson-Mapa in view of U.S. Published Application U.S. 2002/0075232 applied for by Daum and U.S. Patent No. 3,761,965 issued to Barasch?
2. Are claims 7 and 14 obvious over Hutchinson-Mapa in view of Daum and U.S. Patent No. 3,761,965 issued to Barasch and in further view of U.S. Patent No. 4,536,890 issued to Barnett?

Grouping of Claims

Claims 1-14 subject to the instant appeal are not being treated as a single grouping. The appealed claims do not stand or fall together for reasons given in conjunction with the arguments set forth below. Each appealed claim separately is believed to be patentable.

<u>Argument</u>

As an initial point, it should be noted that claims 1-7 are addressed to a method for accessing electrical components energized at 500 volts rms or below. Claims 8-13 are identical to claims 1-6, respectively, except that claims 8-14 are addressed to a method for accessing electrical components energized at 1000 volts rms or below. For the sake of brevity, the arguments presented herein will be made in the context of claims 1-7. The same arguments are applicable to claims 8-14.

Claims 1-6 and 8-13 stand rejected under §103 as being unpatentable in view of French Patent 2,448,307 ("Hutchinson") in view of U.S. Published Application U.S. 2002/0075232 ("Daum") and U.S. Patent No. 3,761,965 ("Barasch"). These references, even taken in combination, do not render the present method obvious.

Claims 1-6 and 8-13 are addressed to methods for accessing electrical components energized at relatively low voltages, i.e., below 1000 volts rms. The method includes the steps of providing a tightly fitting rubber insulating glove and lining at least the palm region and hand region of the glove's interior, the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions. The method goes on to recite that the glove is placed on the hand and the electrical components are accessed. Lastly, the glove is periodically removed from the hand to cool and remove moisture, and then replaced on the hand.

Table I sets forth the references cited by the Examiner along, with those features in the references that are relevant to the claimed invention. Table II identifies those claim elements that are absent from each of the cited references.

TABLE I

Feature	Kolcio (Present Invention)	Hutchinson	Daum	Barasch	Barnett
Field	Glove for Accessing Electrical Components	Glove for Accessing Electrical Components	Glove for Detecting Motion of Body Parts	Surgical Glove	Glove for Use in Clean Environment
Voltage	< 1000 volts rms or < 500 volts rms	> 5000 volts rms	NA	NA	NA
Electrically Energized Components Accessed	Nuts, bolts, washers, etc.		NA	NA	NA
Glove Structure	a "tightly fitting rubber insulating glove" lined with a partial flocking layer	3 layers including: 1) An elastomeric outer layer resistant to chemical aggression agents 2) A middle layer having extensive dielectric properties 3) An internal layer having thermal insulative properties	6 layers including: 1) outer isolating layer 2) conductive rubber layer 3) inner isolating layer 4) metallic foil 5) isolation foil 6) inner isolation layer	A thin resin film having a vinyl chloride granular textured inner surface	Elastomeric shell with an internal line attached to the hand portion
Flocking	Partial	None	None	None	Entire Hand

Inner Treatment	Partial flocking, "diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions"	Thermal insulation covering entire hand	NA	Vinyl chloride granules	Flocking on entire hand but not forearm
Method for Applying Inner Treatment	Spraying into opening of glove	Glove formed by first providing a form in the configuration of a hand; dipping the form in suitable material to create exterior layer, applying middle layer of elastomer, applying textile fibers by flocking, then turning the glove inside-out	NA	Glove formed by placing outer film on hand form and heating to partially cure, spraying granules onto partially cured film, heating to completely cure, then removing glove from form and inverting	Spraying flocking on entire hand portion of glove interior, then inverting glove
Inner Treatment Purpose	To absorb sweat	To provide thermal protection	NA	To enable glove to be donned without the use of lubricant such as powder	Comfort, sweat absorption, thermal insulation, and ease of removal and replacement

TABLE II

Hutchinson	From step (a): providing at least one tightly fittable rubber insulating glove effective to electrically insulate a gloved hand from said electrical components, said glove having a palm region, a hand back region, and finger sheaths, each of said finger sheaths extending from a base region to a fingertip region; From step (b): "lining at least the palm region and hand back region of the interior of the glove with a non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions;" From step (e): "periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand."
Daum	From step (a): providing at least one tightly fittable rubber insulating glove effective to electrically insulate a gloved hand from said electrical components, said glove having a palm region, a hand back region, and finger sheaths, each of said finger sheaths extending from a base region to a fingertip region; From step (b): lining at least the palm region and hand back region of the interior of the glove with a non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions; From step (c): placing said lined glove on the hand to provide a tightly fitting gloved hand; From step (d): accessing said electrical components with said gloved hand; and From step (e): periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand.

Barasch	From step (a): providing at least one tightly fittable rubber insulating glove effective to electrically insulate a gloved hand from said electrical components, said glove having a palm region, a hand back region, and finger sheaths, each of said finger sheaths extending from a base region to a fingertip region; From step (b): lining at least the palm region and hand back region of the interior of the glove with a non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions; From step (c): placing said lined glove on the hand to provide a tightly fitting gloved hand; From step (d): accessing said electrical components with said gloved hand; and From step (e): periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand.

First, Appellant would respectfully submit that the Examiner's §103 rejections involve improper hindsight reconstruction of the invention. Table I above illustrates this point. Not having been able to uncover more than one reference in the pertinent field of electrician's gloves, the Examiner picked and chose features of various gloves in a number of art fields and then combined them to recreate the invention. The references cited include disclosures of gloves in the surgical field and the clean room or low particle environment field. The Examiner even cites a glove used for controlling computer games and in robotics. When combining references under §103, there also must be a teaching or motivation to combine the references. The motivation or teaching to combine the references simply is not present in this case. As such, the § 103 rejections are improper.

Even assuming, *arguendo*, that the references can properly be combined, they do not disclose the invention. Looking first to Hutchinson, as Table II illustrates, several features recited in claim 1 are absent from Hutchinson. Hutchinson does not teach the step of providing a "rubber insulating glove effective to electrically insulate a gloved hand from said electrical components". Hutchinson also does not teach the step of lining such a glove with flock "effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions". Finally, Hutchinson does not teach the step of "periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand".

Hutchinson calls for a different glove construction than that of the present invention, because it is intended to meet different voltage requirements for accessing different components. Rather than being a tight fitting rubber glove with partial flocking, Hutchinson incorporates three gloves into one. Hutchinson's glove includes an outer layer resistive to chemical aggression agents, a middle electrically protective layer, and an inner thermally insulative layer. Hutchinson, page 4, lines 15-24 and Fig. 2. The differences in construction of the Hutchinson and Kolcio gloves are directly related to the different functions for which the gloves are used. For example, the Hutchinson glove is intended to access different electrical components than the Kolcio glove. Hutchinson's glove is intended for use with much larger parts energized at 5 times or more the voltage of those accessed by the present glove. Hutchinson, page 2, lines 24-25. The parts accessed must be correspondingly larger and more durable in order to withstand those higher voltage rates. Because the parts are generally larger and more durable, Hutchinson does not need to be concerned with dexterity to the extent that the present glove is. This is evidenced by the fact that Hutchinson discloses an inner layer extending over the entire hand, including the fingertip regions. See Hutchinson, Fig. 2. Hutchinson does not recognize the advantage of leaving the fingertip regions substantially free of flocking. The

dexterity of the present invention, conversely, is achieved by having substantially no flocking in the fingertip regions. Finally, partial flocking facilitates the putting on and taking off of the inventive glove. Hutchison's glove does not. Rather than facilitating removal and absorbing sweat Hutchinson's glove provides thermal protection. Hutchinson, page 2, lines 27-28.

Looking next to the next reference, Daum is a glove used to detect motion of parts of a body. Data gloves, of the type disclosed in Daum, are used for controlling computer games and in robotics. Daum, Paragraph 0002. The glove is composed of six distinct layers, including: 1) an outer isolating layer; 2) a conductive rubber layer; 3) an inner isolating layer; 4) a metallic foil; 5) an isolation foil; and 6) an inner isolation layer. See Daum, Fig. 3A and the accompanying description in Paragraph 0038. Daum's glove is not an electrician's glove. It is not designed to access electrical components energized at any voltage.

Daum does not teach any of the features of the invention. In particular, Daum does not teach providing a "rubber insulating glove effective to electrically insulate a gloved hand from said electrical components". Daum also does not teach lining an insulative glove with a non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions". Daum does not teach accessing electrical components with a gloved hand since Daum is not an electrician's glove. Finally, and most importantly, Daum does not teach "periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand."

Daum is cited for the proposition that a rubber glove builds up sweat inside the glove and therefore that and that, as a result, it is common for a user to take a rest from using the glove after only several minutes. What Daum teaches, however, is the exact opposite. Daum's solution to the problem of sweat build-up is to make a rubber glove using a specially constructed plastic, which allows the user to wear the glove for long periods of time without having to take the glove off. . Daum, Paragraphs 0006 and 0011. The purpose of Daum is to eliminate the user's need to take the glove on and off to cool the hand and remove moisture. Thus, Daum expressly teaches away from the solution presented by the present invention, which is to enable the user to repeatedly take a glove off and replace it on the hand. Daum is, therefore, completely inapplicable to the present invention.

The Examiner, having cited a problem recognized by Daum, ignores Daum's solution and combines Daum with Barasch, which teaches a solution expressly disavowed in Daum. Barasch discloses a single use, disposable surgical glove whose interior has a vinyl chloride granular textured surface. See Barasch, Col. 6, lines 1-10. The texturing enables the glove to be donned without the use of a lubricant, such as powder. Id. Barasch does not teach

providing a "fittable rubber insulating glove effective to electrically insulate a gloved hand from said electrical components". Barasch is not a glove intended to be used to access electrical components. It is intended to protect the surgeon's hands from bodily fluids, contaminants, etc. Appellant has no idea whether Barasch's glove would meet the ASTM requirements for any voltage. There certainly is no teaching in Barasch that the glove can be used for handling electrically energized components. Therefore, Barasch also does not teach the step of accessing electrical components with a gloved hand.

Barasch also does not teach lining the glove with "a non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand". Barasch teaches vinyl particles embedded on the interior surface of a polyvinyl chloride glove. Col. 2, lines 38-45. Such particles clearly are not flock, which generally consist of tufts of wool or cotton fiber. Barasch's particles also are not sweat absorbing, which is one of the advantages achived by using flock.

Finally, Barasch does not teach the step of "periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand". Barasch's glove is not removed and replaced during use. The glove is specifically designed to be disposable, i.e., used once and then thrown away. Barasch, Col. 6, lines 1-10. To do otherwise would be to risk corruption of the sterile surgical field.

None of the references show the step of providing a glove having a "non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand" or the step of "periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand". As such, the cited references, either alone or in combination, do not anticipate or render obvious the claimed invention.

Claims 2-6 and 9-13 are patentable for the reasons given above.

Claims 7 and 14 stand rejected as being unpatentable over Hutchinson in view of Daum and Barasch and in further view of Barnett. The glove described in Barnett, et al., is one intended for clean room fabrication of presumably electrical components. The glove is worn in combination with protective garments such as caps, smocks or gowns and the like and its function is to protect electrical equipment from contamination. For the most part, such equipment will not be electrically energized whatsoever and the patent makes no mention of high voltages or the like. Next, while the involved glove is not described as being electrically insulating nor is the flock employed described as being electrically insulating, such is a requisite for the instant method. It may be noted that the method claimed anticipates that the wearer will remove the gloves in the course of accessing electrical equipment. That is because these gloves, by their insulating mandated nature are very uncomfortable, for example, heat build-up with sweat leads

to discomfort at times within about two minutes. The objective of the method is to make it easy to take them off as opposed to the glove of Barnett, et al., which is flocked to make it comfortable.

Conclusion

Accordingly, Appellants respectfully urge the Board to overrule the rejection of the appealed claims and to permit the appealed application to pass to issue.

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APPENDIX A

The Appealed Claims

1. The method for accessing electrical components energized at voltages of about 500 volts rms and below, comprising the steps of:

(a) providing at least one tightly fittable rubber insulating glove effective to electrically insulate a gloved hand from said electrical components, said glove having a palm region, a hand back region, and finger sheaths, each of said finger sheaths extending from a base region to a fingertip region;

(b) lining at least the palm region and hand back region of the interior of the glove with a non-conductive, adhesively retained flock effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions;

(c) placing said lined glove on the hand to provide a tightly fitting gloved hand;

(d) accessing said electrical components with said gloved hand; and

(e) periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand.

2. The method of claim 1 including the step of:

(f) subsequent to said step (a) roughening the external surface of said glove at said inward fingertip regions to an extent effective to facilitate the finger manipulation of small parts of said electrical components while maintaining said effective electrical insulation.

3. The method of claim 2 in which said glove is roughened at said inward fingertip regions and at the palm region thereof.

4. The method of claim 3 in which said glove is roughened at said inward fingertip regions and at said palm region by the formation of ridges extending into its external surface.

5. The method of claim 4 in which said formation of ridges is provided as a triangular pattern.

6. The method of claim 1 in which said step (b) is carried out by lining at least said palm region, hand back region and the initial finger joint regions of the glove.

7. The method of claim 1 in which said step (b) is carried out by spraying a non-conductive adhesive born flock through the hand access opening of said glove.

8. The method for accessing electrical components energized at voltages of less than about 1000 volts rms, comprising the steps of:

(a) providing at least one tightly fittable rubber insulating glove effective to electrically insulate a gloved hand from said electrical components, said glove having a palm region, a hand back region, and finger sheaths, each of said finger sheaths extending from a base region to a fingertip region;

(b) lining at least the palm region and hand back region of the interior of the glove with a non-conductive adhesively retained flock effective to facilitate removal of the glove from the hand with the flock diminishing from the bases of the finger sheaths to be substantially absent at the fingertip regions;

(c) placing said lined glove on the hand to provide a tightly fitting gloved hand;

(d) accessing said electrical components with said tightly gloved hand; and

(e) periodically removing said glove from said gloved hand to cool and remove moisture from the hand and glove and thereafter replacing said glove upon said hand.

9. The method of claim 8 including the step of:

(f) subsequent to said step (a) roughening the external surface of said glove at the inward fingertip regions to an extent effective to facilitate the finger manipulation of small parts of said electrical components while maintaining said effective electrical insulator.

10. The method of claim 9 in which said glove is roughened at said inward fingertip regions and at the palm region thereof.

11. The method of claim 10 in which said glove is roughened at said inward fingertip regions and at said palm region by the formation of ridges extending into its external surface.

12. The method of claim 11 in which said formation of ridges is provided as a triangular pattern.

13. The method of claim 8 in which said step (b) is carried out by lining at least said palm region, hand back region and the initial finger joint regions of the glove.

14. The method of claim 8 in which said step (b) is carried out by spraying a non-conductive adhesive born flock through the hand access opening of said glove.

APPENDIX B

HUTCHINSON – FRENCH PATENT NO. 2,448,307

PTO 03-768 French Patent No. 2 448 307

IMPROVEMENTS PROVIDED FOR PROTECTIVE GLOVES, PARTICULARLY FOR ELECTRICIANS, AND FOR THEIR PROCESSES OF MANUFACTURING

Joint-stock company known as: Hutchinson-Mapa

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. DECEMBER 2002
TRANSLATED BY THE RALPH MCELROY TRANSLATION COMPANY

REPUBLIC OF FRANCE
NATIONAL INSTITUTE OF INDUSTRIAL PROPERTY
PARIS
FRENCH PATENT NO. 2 448 307

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IMPROVEMENTS PROVIDED FOR PROTECTIVE GLOVES, PARTICULARLY FOR ELECTRICIANS, AND FOR THEIR PROCESSES OF MANUFACTURING

[Perfectionnements apportes aux gants de protection, notamment pour electriciens et a leurs procedes de fabrication]

Applicant:	Joint-stock company known as: Hutchinson-Mapa, residing in France

The present invention relates to improvements provided for protective gloves, /*1
particularly for electricians, and for their processes of manufacturing.

The protective gloves for electricians offered up to now are made of elastomer such as rubber and are produced by dipping of a form in a rubber solution or a latex emulsion which contains additives which give the final product dielectric properties. However, although such rubber or latex gloves provide effective protection for their users when they are employed under voltage, they can nevertheless be altered in contact with grease and solvents.

Furthermore, the insulating gloves made of rubber are not very comfortable to wear because they do not always provide good thermal insulation: they do not slide well and are consequently difficult to put on and take off; moreover, they cause extensive sweating of the hands. In order to palliate these disadvantages, it has been proposed according to prior art to provide insulating gloves for electricians with an interior lining made of textile material which provides thermal insulation for the user and facilitates putting on and taking off of the gloves.

* [Numbers in the right margin indicate pagination of the foreign text.]

This solution however has the great disadvantage of considerably reducing the dielectric constant of the dielectric elastomer material constituting the insulating glove because of the presence of small electricity conducting hairs on the textile material, so that the insulation properties of such gloves are difficult to obtain in a constant and reproducible manner.

Consequently, electricians are frequently led to protecting their hands by wearing several superposed gloves, namely: a glove made of textile in contact with the skin, which provides the desired thermal insulation, a glove made of dielectric elastomer worn over the textile glove, which provides the desired electrical insulation, and a leather glove worn over the latter and which protects it from impacts and alterations by mechanical agents; however, wearing such a superposition of gloves is awkward and moreover considerably alters the tactile capability of the user because of the thickness and stiffness of the triple combination of protective and insulating gloves.

The present invention is consequently dedicated to the aim of providing a protective /2
glove for electricians which meets practical needs better than the previously proposed insulating gloves according to prior art, particularly by the fact that it has extensive dielectric properties, while providing the user with the necessary comfort and thermal insulation, by the fact that it has a good resistance to chemical aggression agents, such as greasy materials, solvents, ozone, etc... and to ultraviolet radiation, and by the fact that it has anti-slip properties.

The present invention relates to a protective glove for electricians, which is given extensive dielectric properties, which is capable of providing protection under test voltages of at least 5000 volts, and which has extensive resistance to chemical aggression agents and to ultraviolet radiation, glove which is characterized by the fact that it includes, in combination: - at least one exterior layer made of synthetic elastomer, which has extensive resistance to chemical aggression agents and to ultraviolet radiation; - at least one middle layer made of natural or synthetic elastomer which has extensive dielectric properties, which is capable of providing electrical insulation at test voltages of at least 5000 volts; - and an internal layer of natural or synthetic textile fibers applied by flocking on the surface of the median layer – or of one median layer – turned towards the interior of the glove, internal layer which has excellent comfort and thermal insulation properties.

According to a preferred embodiment of the insulating glove for electricians according to the present invention, the exterior layer, or outer-most layer, of the glove, made of synthetic elastomer, is provided, on the surface of the glove which corresponds to the anterior surface of the hand, with anti-slip surfaces manufactured integrally and consisting, for example, of a number of juxtaposed ribs or of a number of raised projections in the form of stubs, which cover appropriate parts of the anterior surface of the glove or all of said surface.

According to the invention, the exterior layer made of synthetic elastomer is produced out of a synthetic elastomer which can be, for example, but in a non-limiting manner, polychloroprene, polyurethane, nitrile rubber, etc...

In a known manner, the exterior layer or layers made of synthetic elastomer having /3
extensive properties of resistance to chemical agents and to ultraviolet radiation, is (are) given a different color from that of the middle layer or layers having extensive dielectric properties, in order to be able to see the wear and tear of the glove according to the invention.

The present invention also relates to a process for manufacturing of the insulating glove for electricians as defined above, process which consists: - of first of all producing, on a form or mold with the configuration of a hand, at least one exterior layer of a synthetic elastomer with extensive resistance to chemical aggression agents, to ozone and to ultraviolet radiation, in particular, by dipping of said mold or form in a solution or in an emulsion of a synthetic elastomer which contains additives suitable for giving it the aforementioned properties of resistance; - then of applying on the exterior layer or on an exterior layer, at least one middle layer of a natural or synthetic elastomer having extensive dielectric properties, capable of providing electrical insulation of the user of the finished glove, for test voltages of at least 5000 volts, by dipping of the mold or form covered with the above-mentioned exterior layer or layers, in a solution or in an emulsion of natural or synthetic elastomer containing additives suitable for giving it said dielectric properties; - then of applying, on said middle layer or on a middle layer, a layer of natural or synthetic textile fibers by flocking.

According to an advantageous embodiment of the process to which the present invention relates, the mold or form for manufacturing of the glove has, on its surfaces which correspond to the anterior surface of the hand, grooved zones or zones having a number of small hemispherical craters, representing, in the form of hollows, the configuration of the anti-slip surfaces of the glove, with it possible for said zones to cover or not cover all of the anterior surface of the glove.

According to the invention, the synthetic elastomer having extensive properties of chemical and mechanical resistance and the natural or synthetic elastomer with extensive dielectric properties contain, in a manner known in itself, pigments of different colors. /4

Besides the preceding arrangements, the invention also includes other arrangements which will emerge from the following description.

The invention more particularly relates to protective gloves for electricians according to the preceding arrangements, as well as to their manufacturing processes and the means for implementation of these processes and production of these gloves, as well as to installations for manufacturing of the gloves according to the present invention.

The invention will be better understood with the help of the rest of the description which follows, which refers to the appended drawing in which:

- Figure 1 represents the glove according to the present invention, seen on its anterior surface, and

- Figure 2 is a view in section according to II-II of the glove represented in Figure 1.

It must be understood however that this drawing and the corresponding descriptive parts are given only for the sake of illustrating the object of the invention, of which they do not in any way constitute a limitation.

The glove represented as an example in the drawing and designated generally by the reference 1 has, on its anterior surface 2, anti-slip zones 3 and 4 which cover, for example, as represented, respectively the part of the palm located below the thumb, and the anterior surfaces of the fingers; it will be easily understood that the anti-slip zones can be limited to zone 3, or that they can cover all of the anterior surface of the glove. These anti-slip zones are, in the execution example represented, made up of integrally manufactured ribs obtained by giving the manufacturing mold the corresponding structure in the form of hollows; it will however be easily understood that these ribs can be replaced by any other suitable raised projections, such as hemispherical stubs, for example, also manufactured integrally, by giving the manufacturing mold an appropriate structure in the form of hollows.

As shown in Figure 2, the glove has internal layer 5 made of natural or synthetic textile /5
fibers, deposited by flocking on the surface not connected to the exterior layer, of median layer 6 made of elastomer or a mixture of elastomers having extensive dielectric properties, such as natural rubber, for example. Exterior layer 7 of the glove is produced out of a synthetic elastomer or mixture of elastomers having an extensive resistance to chemical aggression agents such as greasy materials, solvents, to ozone, to ultraviolet radiation, etc..., with it possible for such a synthetic elastomer to advantageously but not exclusively be a polychloroprene, a polyurethane, a polyacrylonitrile, nitrile rubber, etc..., the elastomers or mixtures of elastomers respectively constituting middle layer 6 and exterior layer 7 advantageously containing, in a known manner, colored pigments of different colors in order to be able to see their wear and tear.

Exterior layer 7 and middle layer 6 can each be formed by the superposition of a number of films respectively of the material constituting layer 7 and of the material constituting layer 6.

Layers 7 and 6 are obtained respectively by successive dipping operations, according to the usual techniques, of a mold or of a form of appropriate configuration and possibly of arrangement in solutions or emulsions of the elastomers or mixtures of elastomers defined above and respectively having good properties of resistance to chemical aggression agents and other agents, and good dielectric properties.

The gloves according to the present invention were subjected to a test according to French standard NF C 18415 in order to verify their insulating properties with regard to voltages

of at least 5000 volts and more, that is to say to the tests applicable to the so-called "suede cloth" gloves of type II.

This test consists of filling each glove which is checked with aluminum shot of which the diameter of the grains is between 1 and 1.4 mm, up to 5 cm from the edge of the wrist band of the glove, and then of immersing the glove filled in this way, up to the above-mentioned height, in water at a temperature of approximately 20°C, whose conductivity has been slightly increased by addition of a small amount of sodium chloride.

Two electrodes immersed respectively in the shot of the glove and in the water of the /6
tank connect the two poles of the alternating current source; a milliammeter is mounted for measurement of leakage currents. An alternating current with a frequency of 50 Hz is applied. The rise in voltage takes place gradually over a few seconds up to the voltage of 5000 volts corresponding to type II, which is maintained strictly constant for one minute.

The value of leakage current which is measured during the test was less than 5 milliamps for all the gloves tested, and no puncture was observed on the tested gloves following the test.

The test which was performed showed that the gloves according to the present invention correspond to the characteristics required for being classified in the category of protective gloves of type II at least.

It results from the preceding description that, regardless of the modes of implementation, execution and application which are adopted, protective gloves, in particular for electricians, and processes for manufacturing them are obtained which, in comparison with the previously known protective gloves for the same purpose, offer extensive advantages, certain ones of which were mentioned in the preceding and other advantages of which will emerge from use of said gloves.

As emerges from the preceding, the invention is in no way limited to those of its modes of implementation, execution and application which have just been described more explicitly; it rather includes all variants of them which may occur to the technician in this field, without diverging from the scope or the intent of the present invention.

<u>Claims</u> /7

1. A protective glove for electricians, which is given extensive dielectric properties, which is capable of providing protection under test voltages of at least 5000 volts, and which has extensive resistance to chemical aggression agents and to ultraviolet radiation, glove which is characterized by the fact that it includes, in combination: - at least one exterior layer made of synthetic elastomer, or mixture of synthetic elastomers, which has extensive resistance to chemical aggression agents and to ultraviolet radiation; - at least one middle layer made of natural or synthetic elastomer, or a mixture of elastomers, which has extensive dielectric properties, which is capable of providing electrical insulation at test voltages of at least 5000

volts; - and an internal layer of natural or synthetic textile fibers applied by flocking on the surface of the median layer – or of one median layer – turned towards the interior of the glove, internal layer which has excellent comfort and thermal insulation properties.

2. A protective glove for electricians according to Claim 1, characterized by the fact that the exterior layer, or the outer-most layer, of the glove, made of synthetic elastomer, or of a mixture of elastomers, is provided, on the surface of the glove which corresponds to the anterior surface of the hand, with anti-slip surfaces manufactured integrally.

3. A process for manufacturing of a protective glove for electricians according to either of Claims 1 and 2, characterized by the fact that it consists: - of first of all producing, on a form or mold with essentially the configuration of a hand, at least one exterior layer of a synthetic elastomer, or of a mixture of elastomers, with extensive resistance to chemical aggression agents, to ozone and to ultraviolet radiation, in particular, by dipping of said mold or form in a solution or in an emulsion of a synthetic elastomer, or of an elastomer mixture, which contains additives suitable for giving it the aforementioned properties of resistance; - then of applying on the exterior layer or on an exterior layer, at least one middle layer of a natural or synthetic elastomer, or of a mixture of elastomers, having extensive dielectric properties, capable of providing electrical insulation of the user of the finished glove, for test voltages of at least 5000 volts, by /8
dipping of the mold or form covered with the above-mentioned exterior layer or layers, in a solution or in an emulsion of natural or synthetic elastomer, or of a mixture of elastomers, which contains additives suitable for giving it said dielectric properties; - then of applying, on said middle layer or on a middle layer, a layer of natural or synthetic textile fibers by flocking.

4. A process according to Claim 3, characterized by the fact that the mold or form for manufacturing of the glove has, on its surfaces which correspond to the anterior surface of the hand, zones representing, in the form of hollows, the configuration of the anti-slip surfaces of the glove, with it possible for said zones to cover or not cover all of the anterior surface of the glove.

5. A process according to either of Claims 3 and 4, characterized by the fact that the synthetic elastomer, or the mixture of elastomers, having extensive properties of chemical and mechanical resistance, and the natural or synthetic elastomer, or the mixture of elastomers, with extensive dielectric properties, contain, in a manner known in itself, pigments of different colors.

Fig. 2

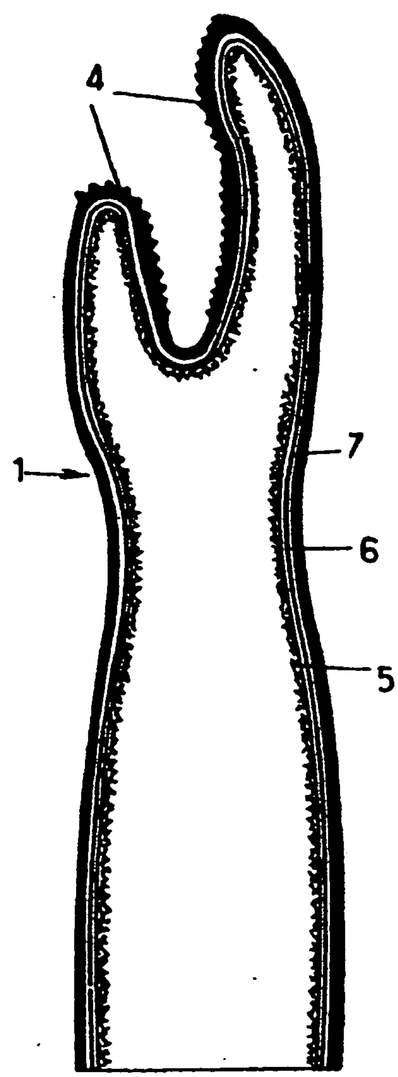
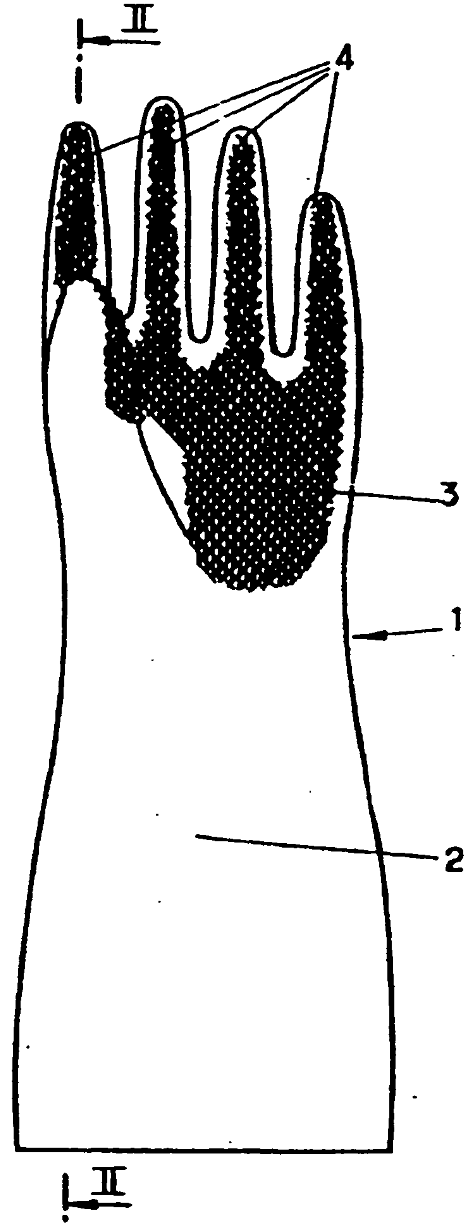


Fig. 1



APPENDIX C

DAUM – U.S. PUBLISHED APPLICATION 2002/0075232 A1

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Daum et al.

(54) DATA GLOVE

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(22) Filed: Dec. 10, 2001

Related U.S. Application Data

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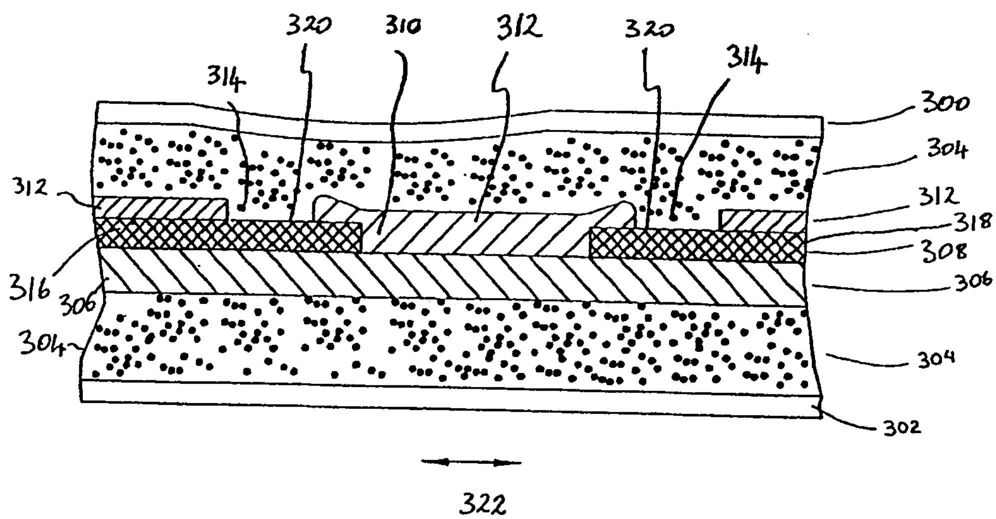
(52) U.S. Cl. 345/158

(57) ABSTRACT

A sensor material for fabricating instrumented clothing includes conductive rubber layer. Two electrodes are disposed within the rubber layer, are connectable to an external circuit and are separated by a separation distance to form an electrical path from one electrode to the other through an intermediate portion of the conducting rubber layer. The electrical resistance measured between the electrodes is indicative of strain in the intermediate portion of the conducting rubber layer, thus permitting measurements of movement of the fabric to be made. The fabric may be used to form articles that a user can wear, including a data glove, so that movements of the user may be detected and measured.



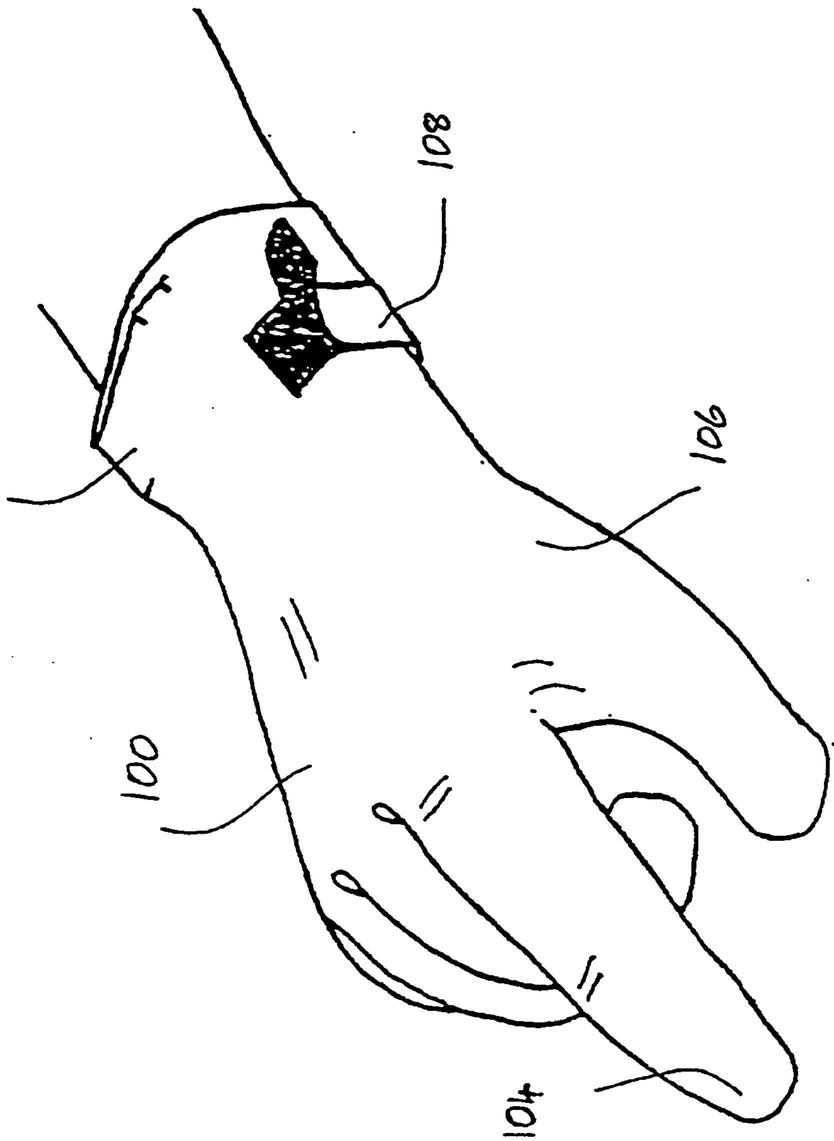


FIG. 1

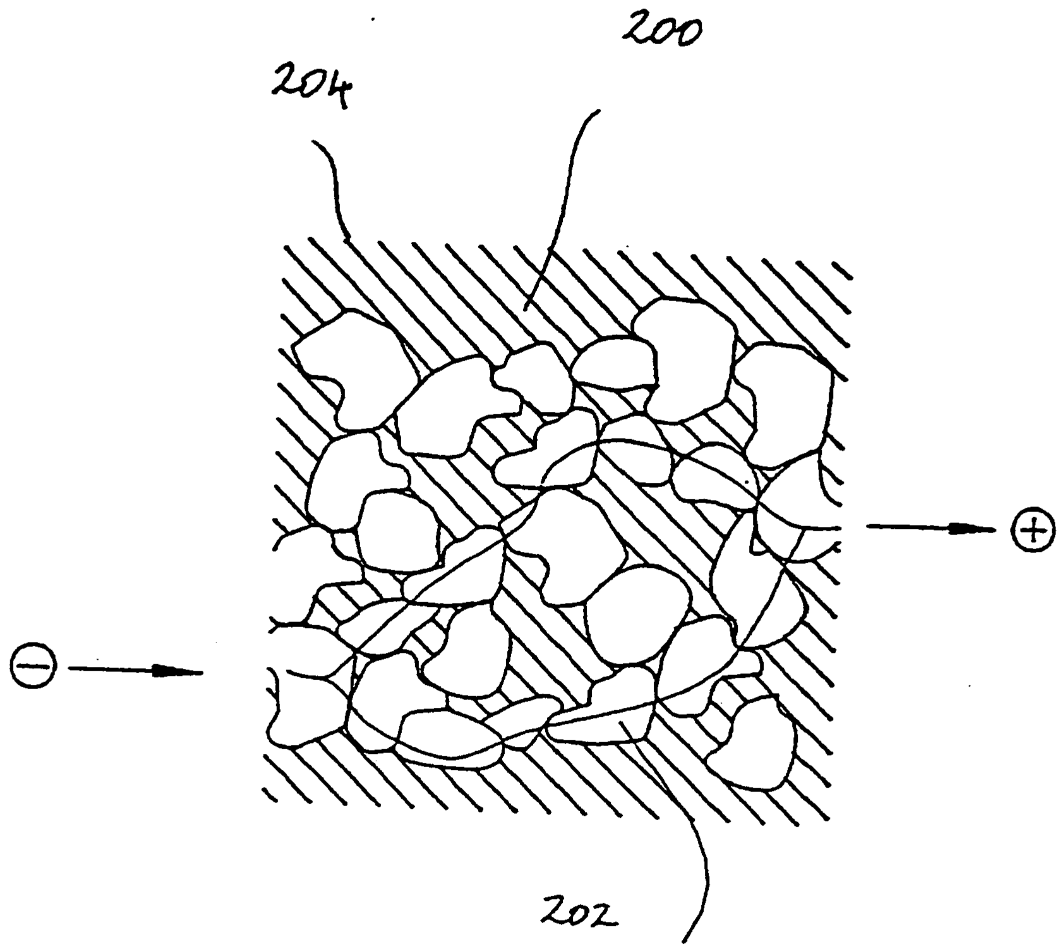


FIG. 2

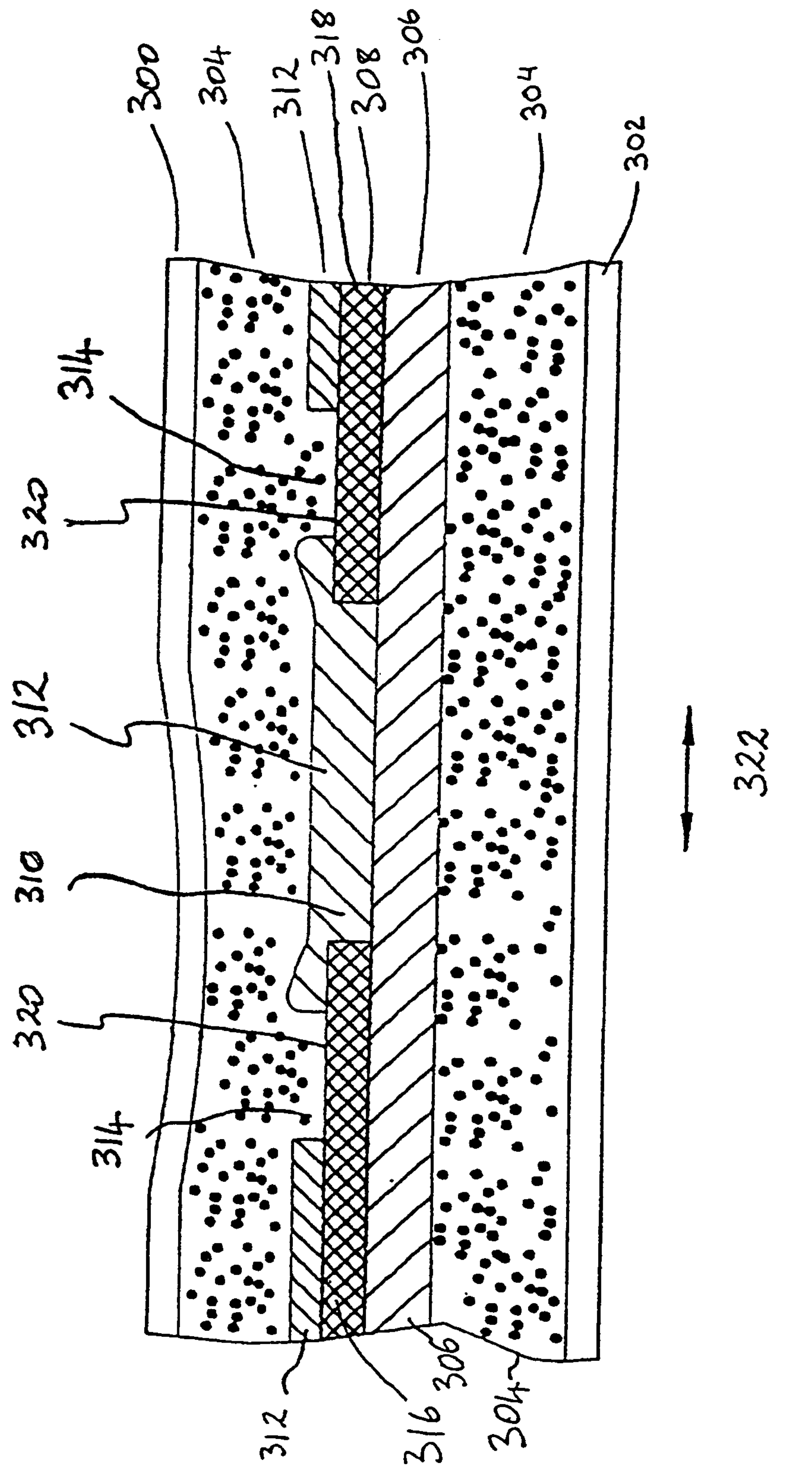

300
304
312
318
308
306
304
302
314
320
312
310
320
314
312
316
306
304
322

FIG. 3A

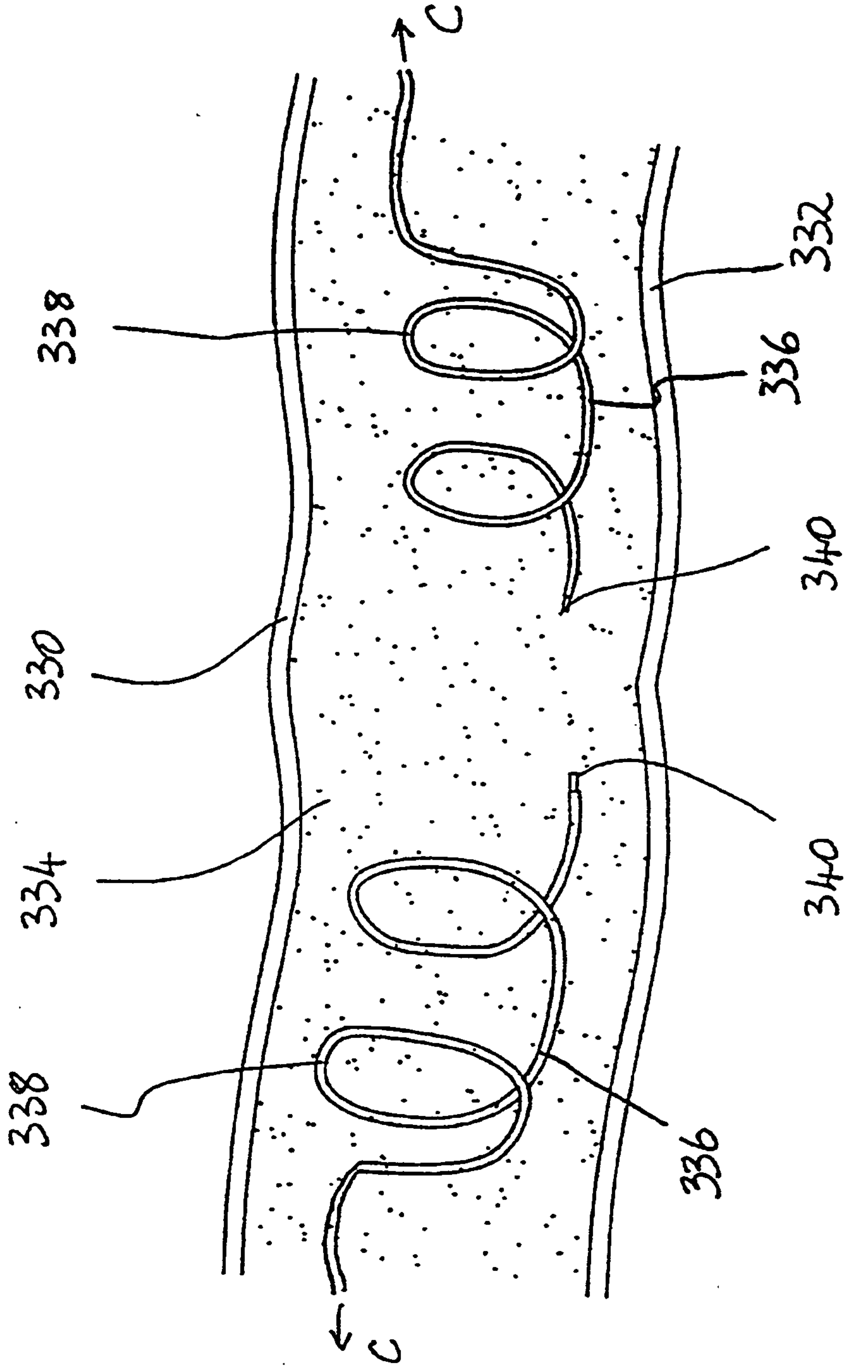


FIG. 3B

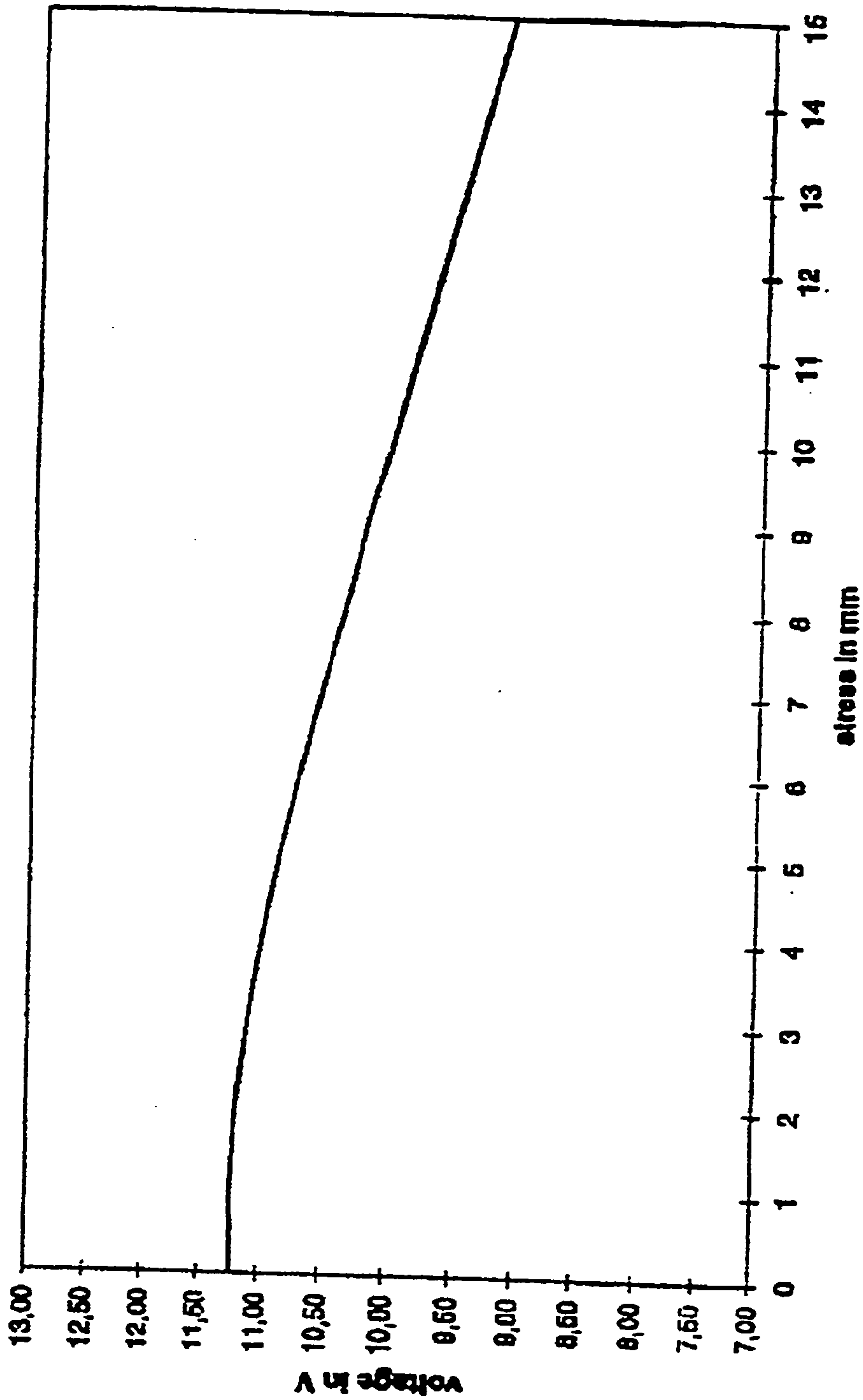

voltage in V
13,00
12,50
12,00
11,50
11,00
10,50
10,00
9,50
9,00
8,50
8,00
7,50
7,00
stress in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

FIG. 4A

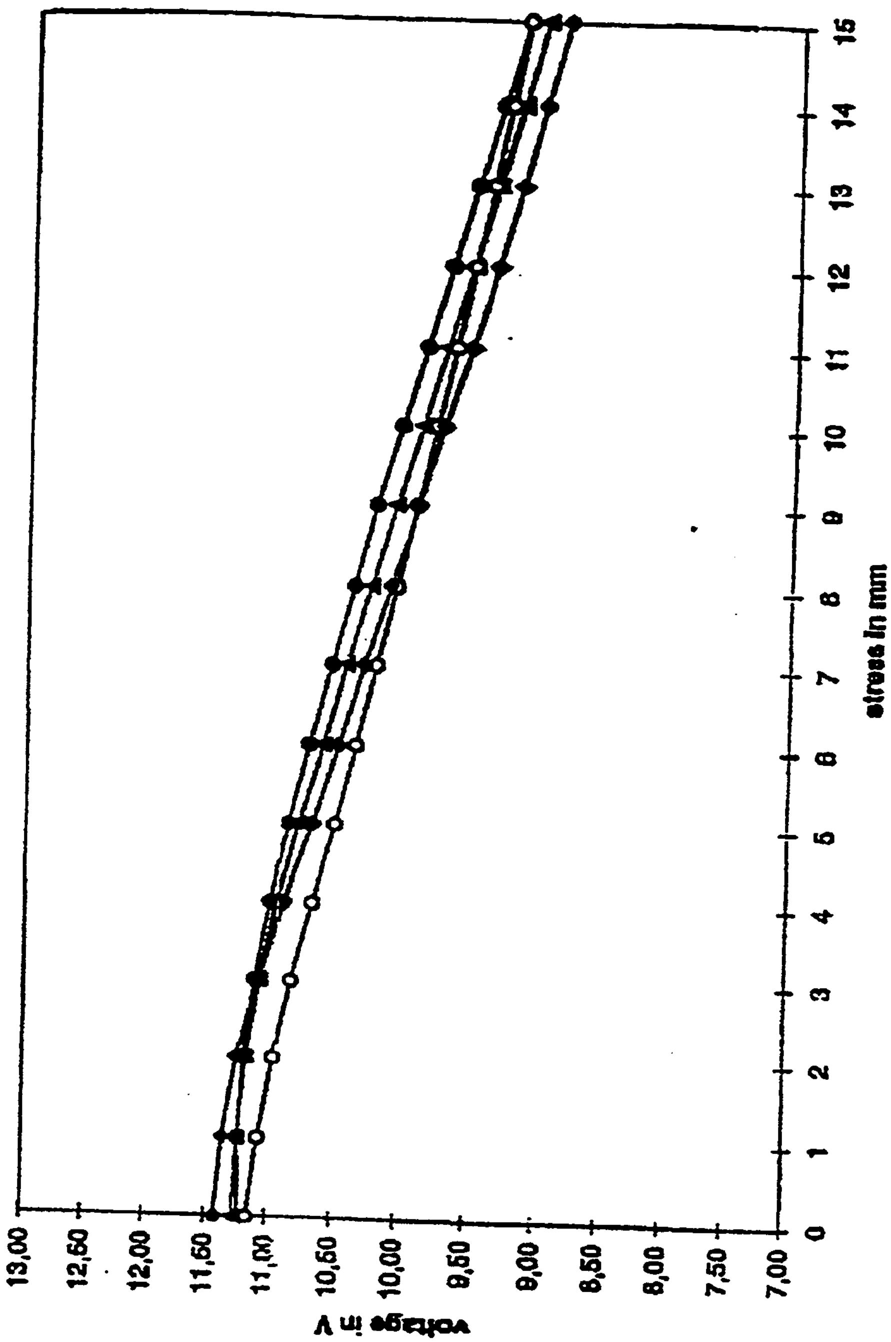

voltage in V
13,00
12,50
12,00
11,50
11,00
10,50
10,00
9,50
9,00
8,50
8,00
7,50
7,00
stress in mm
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

FIG. 4B

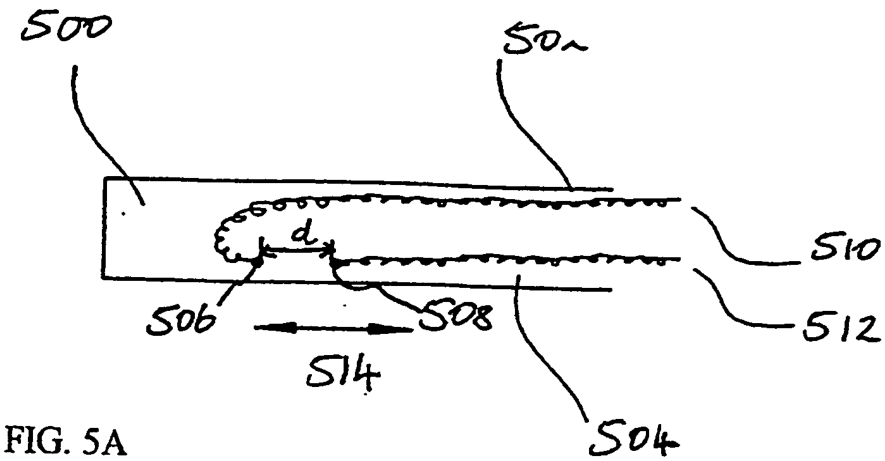

500
50~
d
510
506
508
512
514
504

FIG. 5A

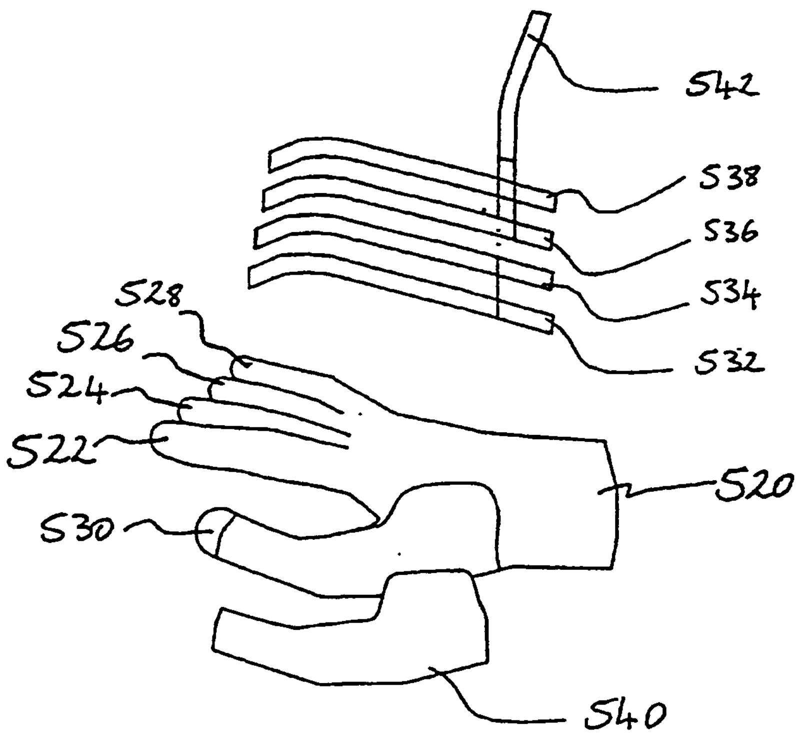

542
538
536
534
532
528
526
524
522
520
530
540

FIG. 5B

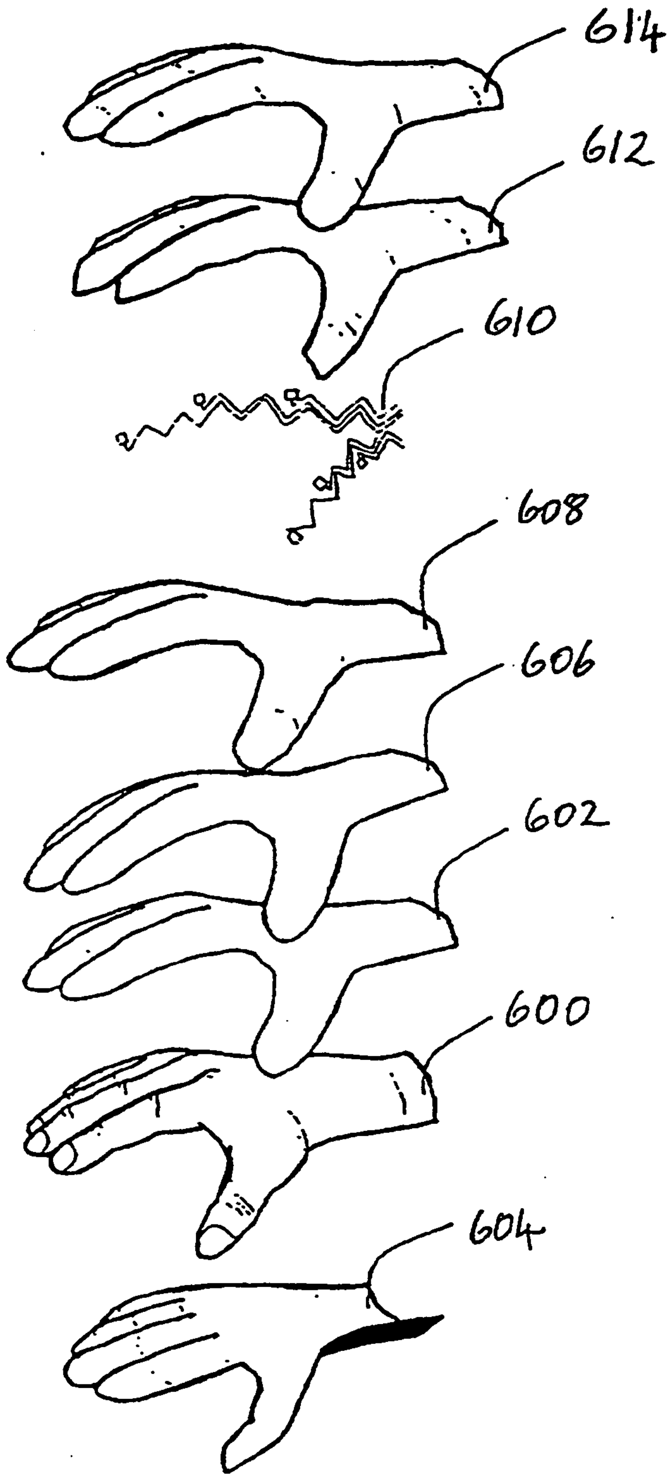


FIG. 6

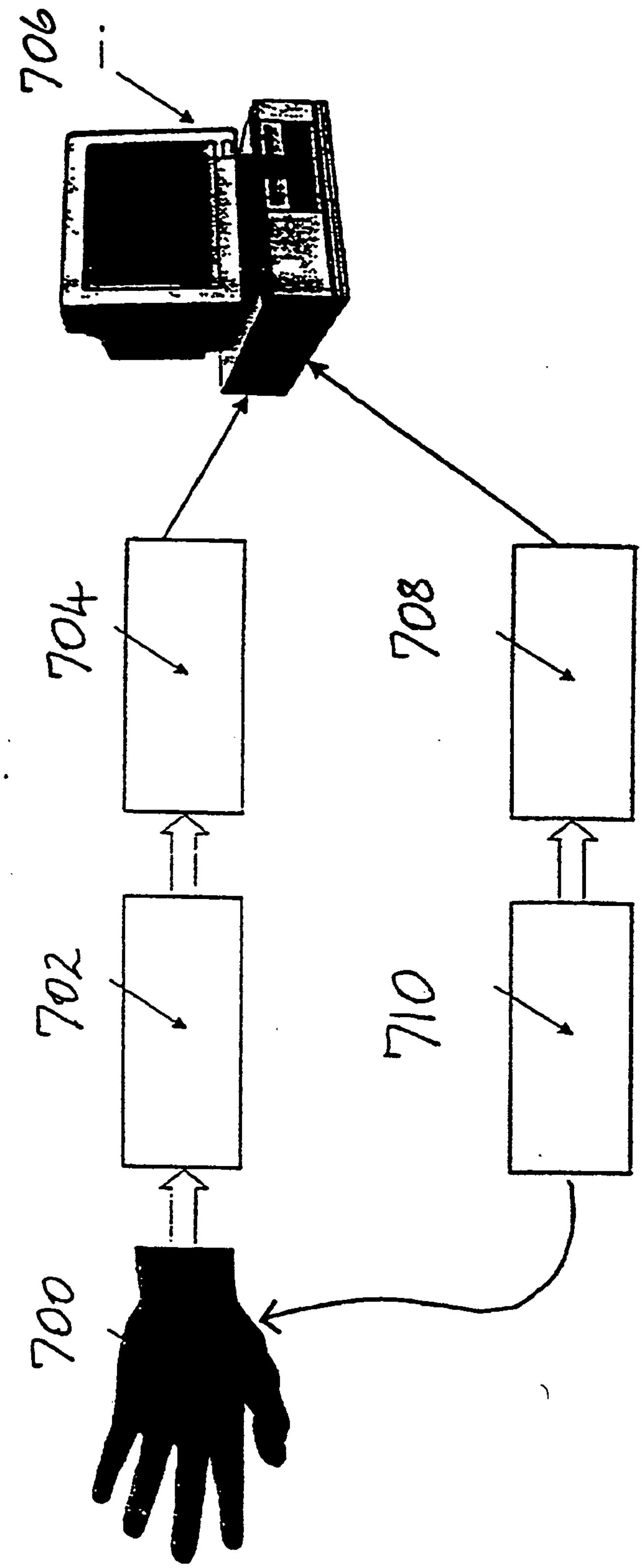


FIG. 7

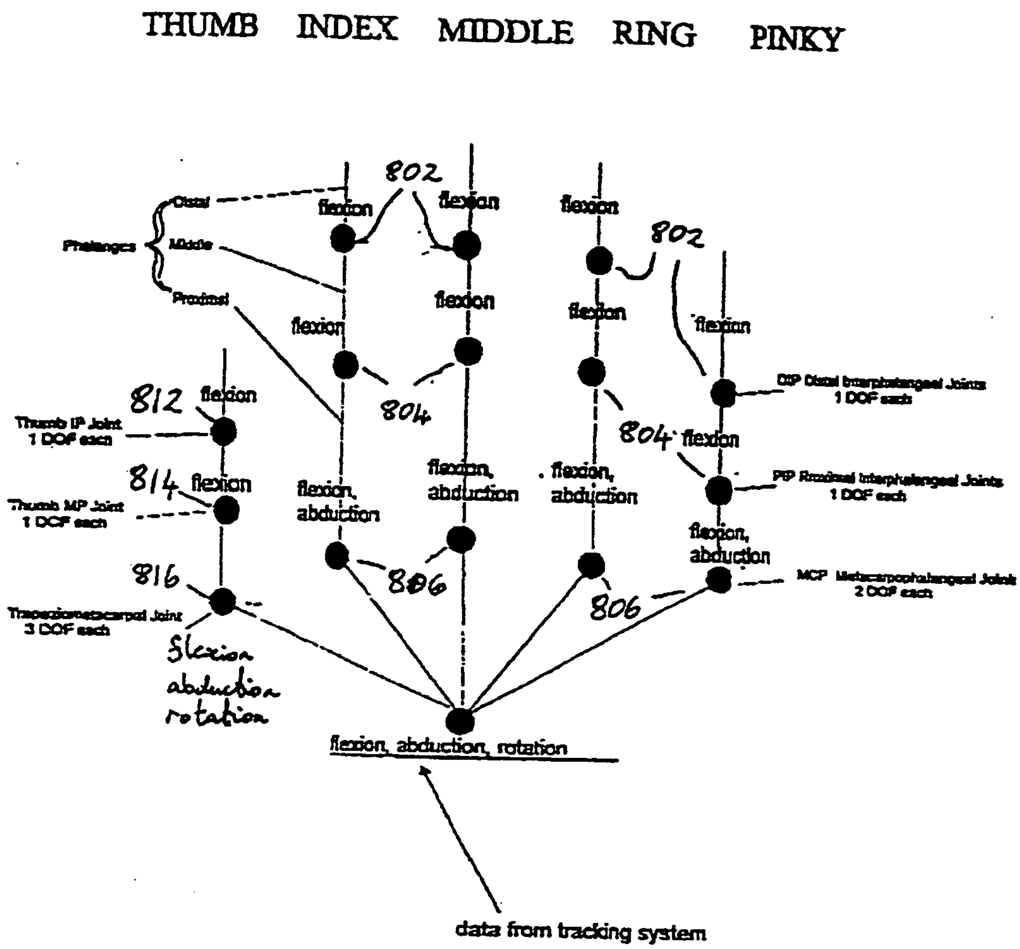

THUMB
INDEX
MIDDLE
RING
PINKY
Phalanges
Distal
Middle
Proximal
802
804
806
812
814
816
flexion
flexion, abduction
Thumb IP Joint 1 DOF each
Thumb MP Joint 1 DOF each
Trapeziometacarpal Joint 3 DOF each
flexion abduction rotation
DIP Distal Interphalangeal Joints 1 DOF each
PIP Proximal Interphalangeal Joints 1 DOF each
MCP Metacarpophalangeal Joints 2 DOF each
flexion, abduction, rotation
data from tracking system

FIG. 8

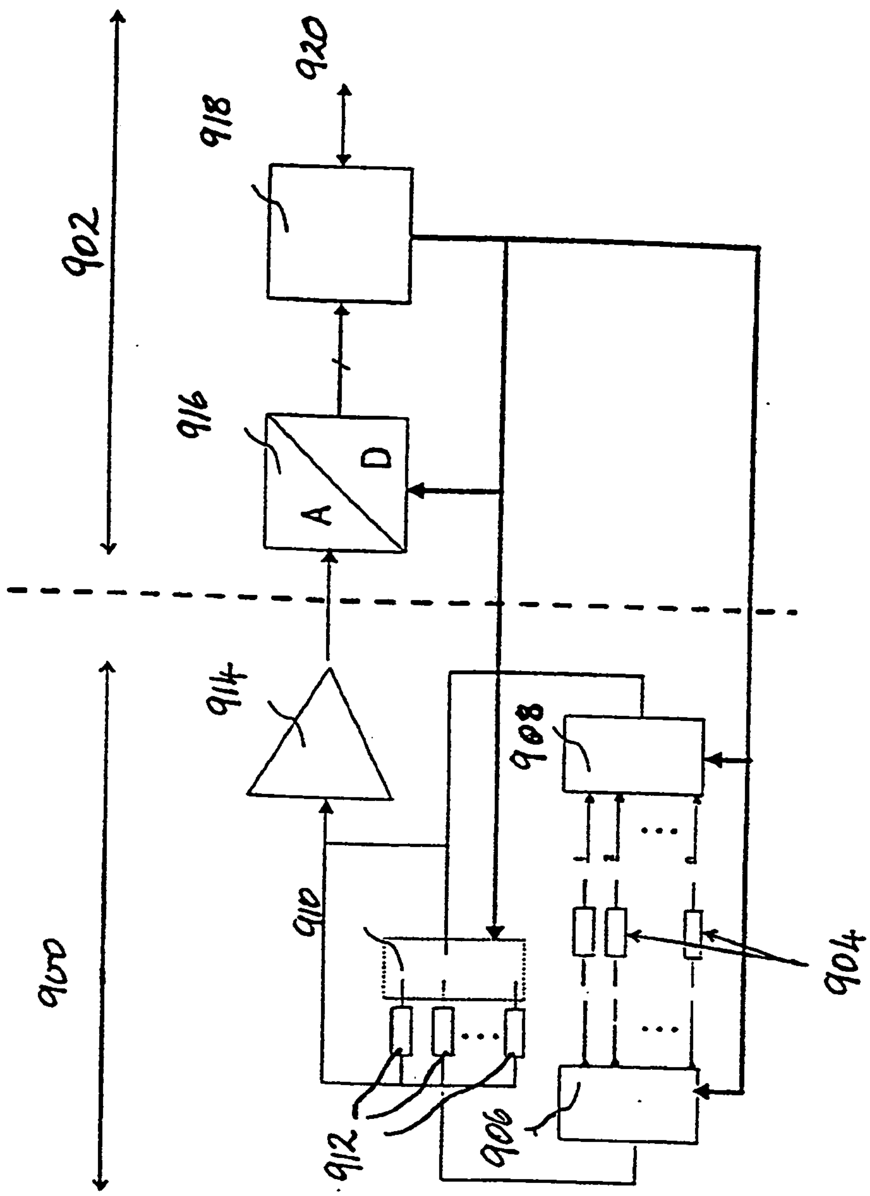


FIG. 9

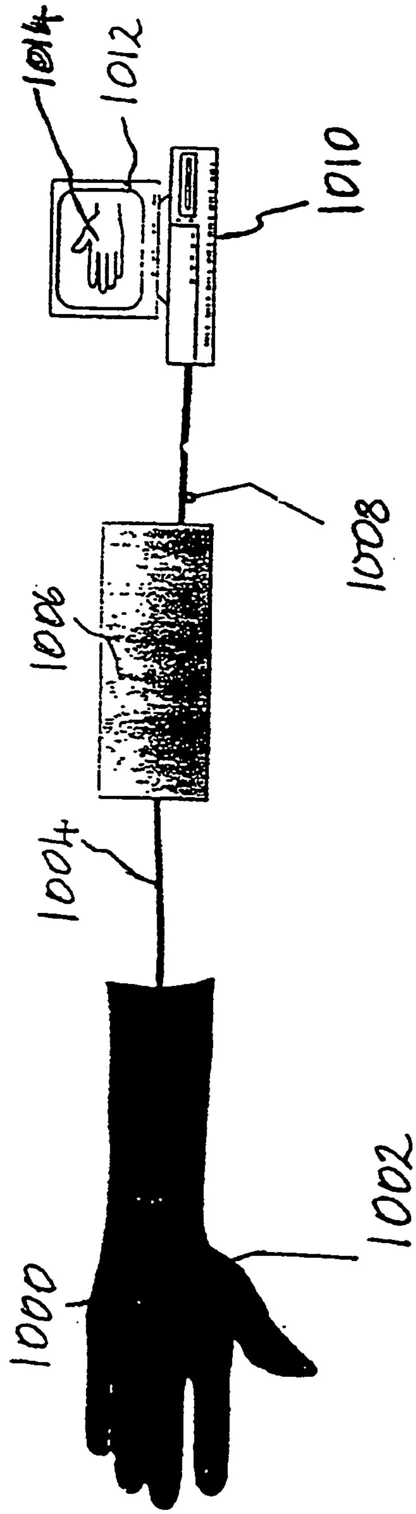


FIG. 10

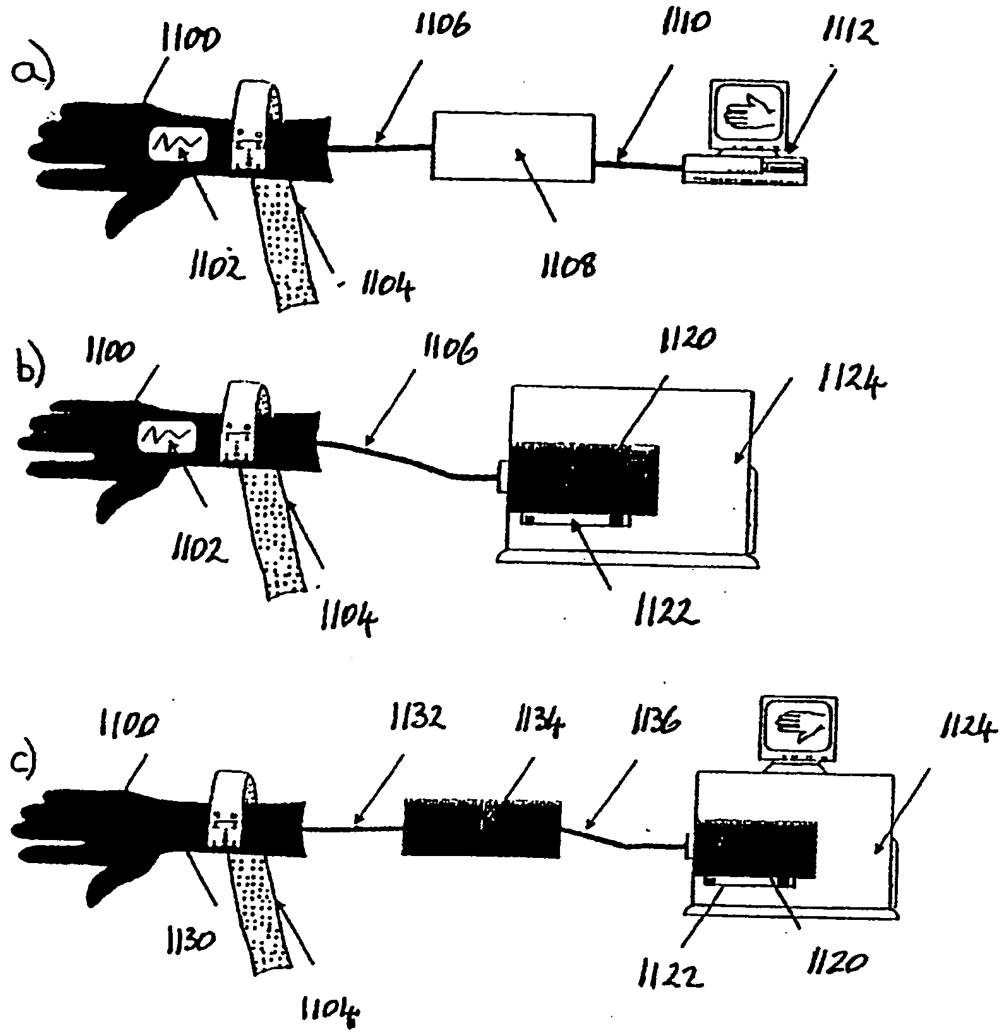

a)
1100
1106
1110
1112
1102
1104
1108
b)
1100
1106
1120
1124
1102
1104
1122
c)
1100
1132
1134
1136
1124
1130
1104
1122
1120

FIG. 11

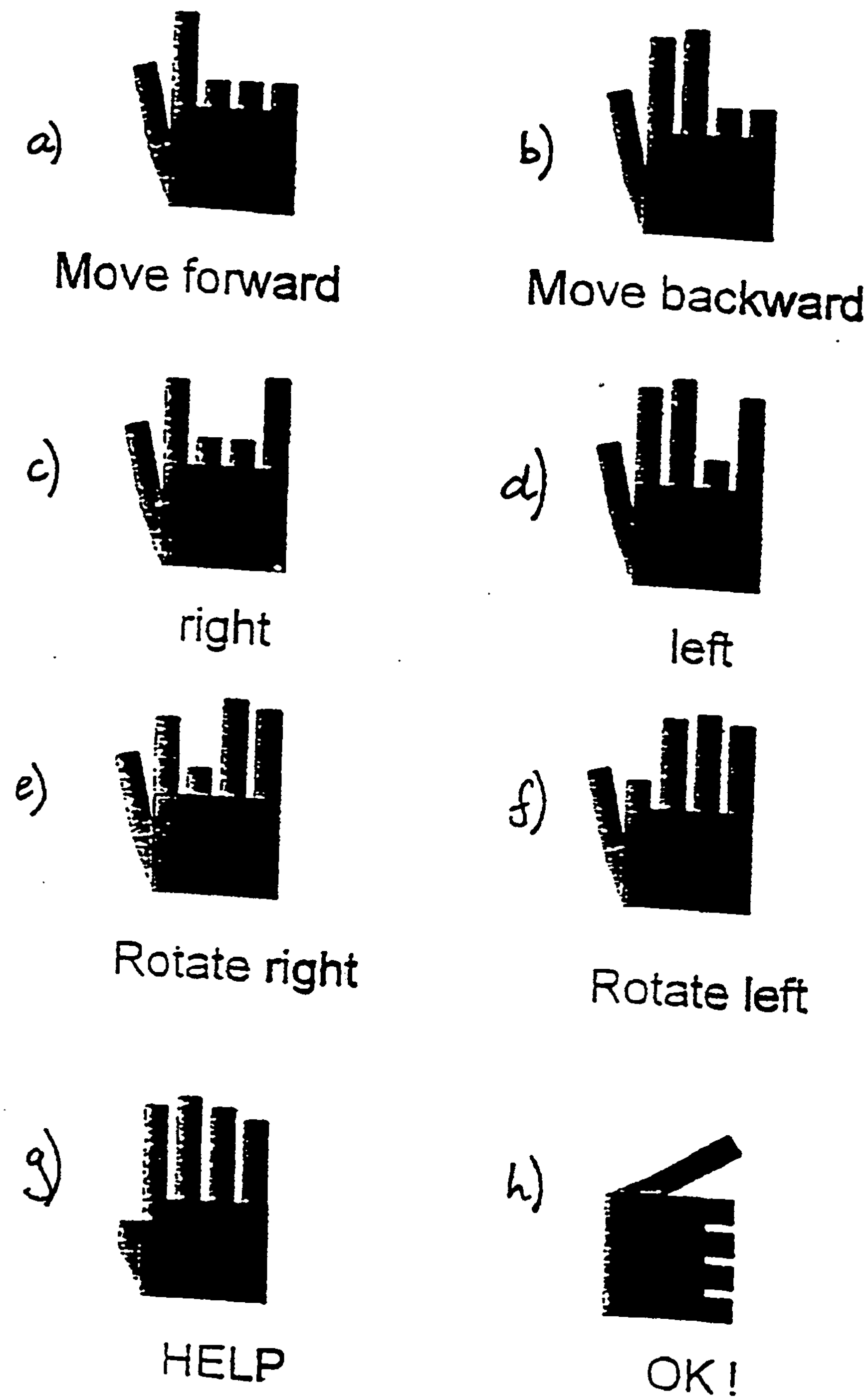

a)
Move forward
b)
Move backward
c)
right
d)
left
e)
Rotate right
f)
Rotate left
g)
HELP
h)
OK!

FIG. 13

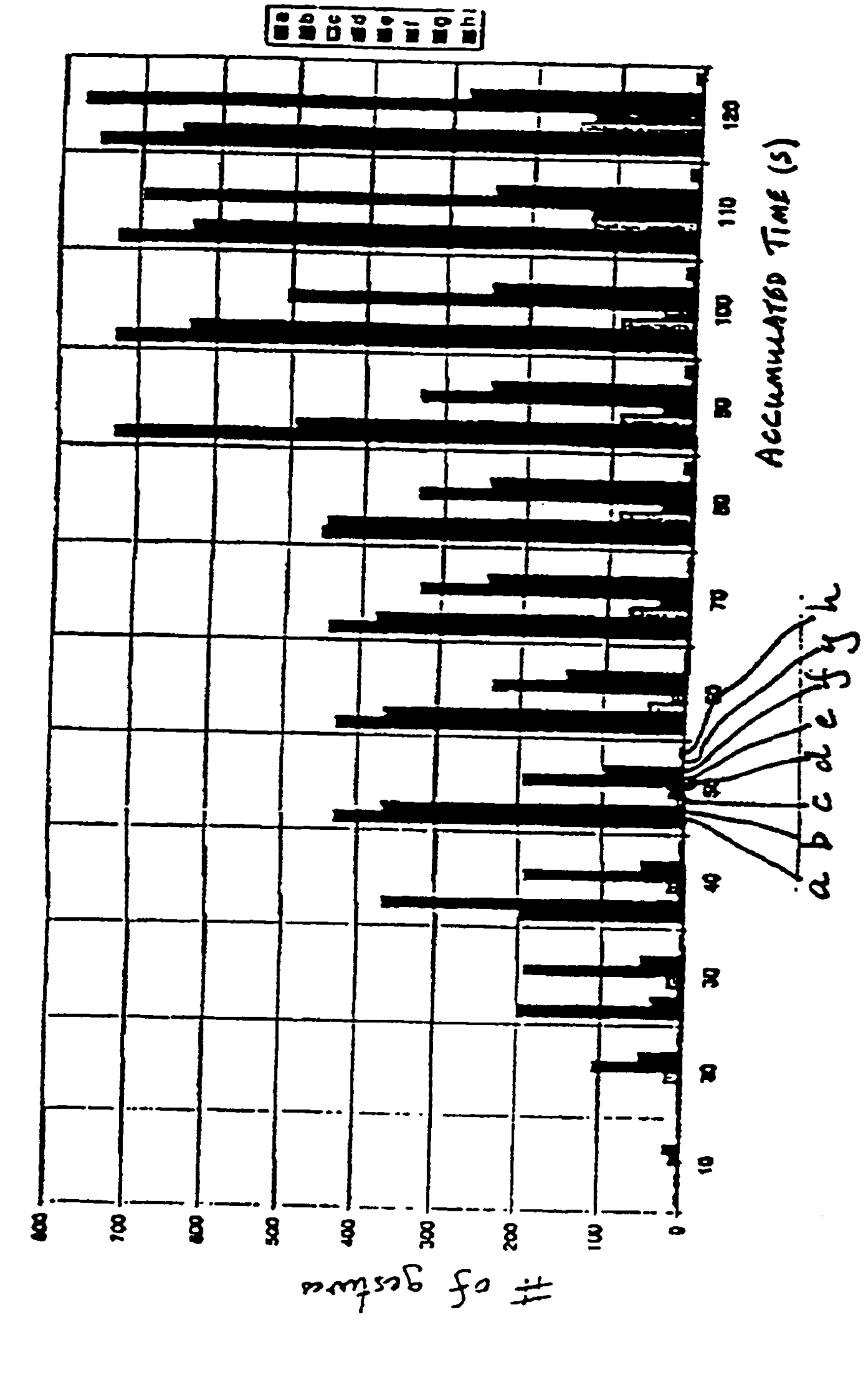
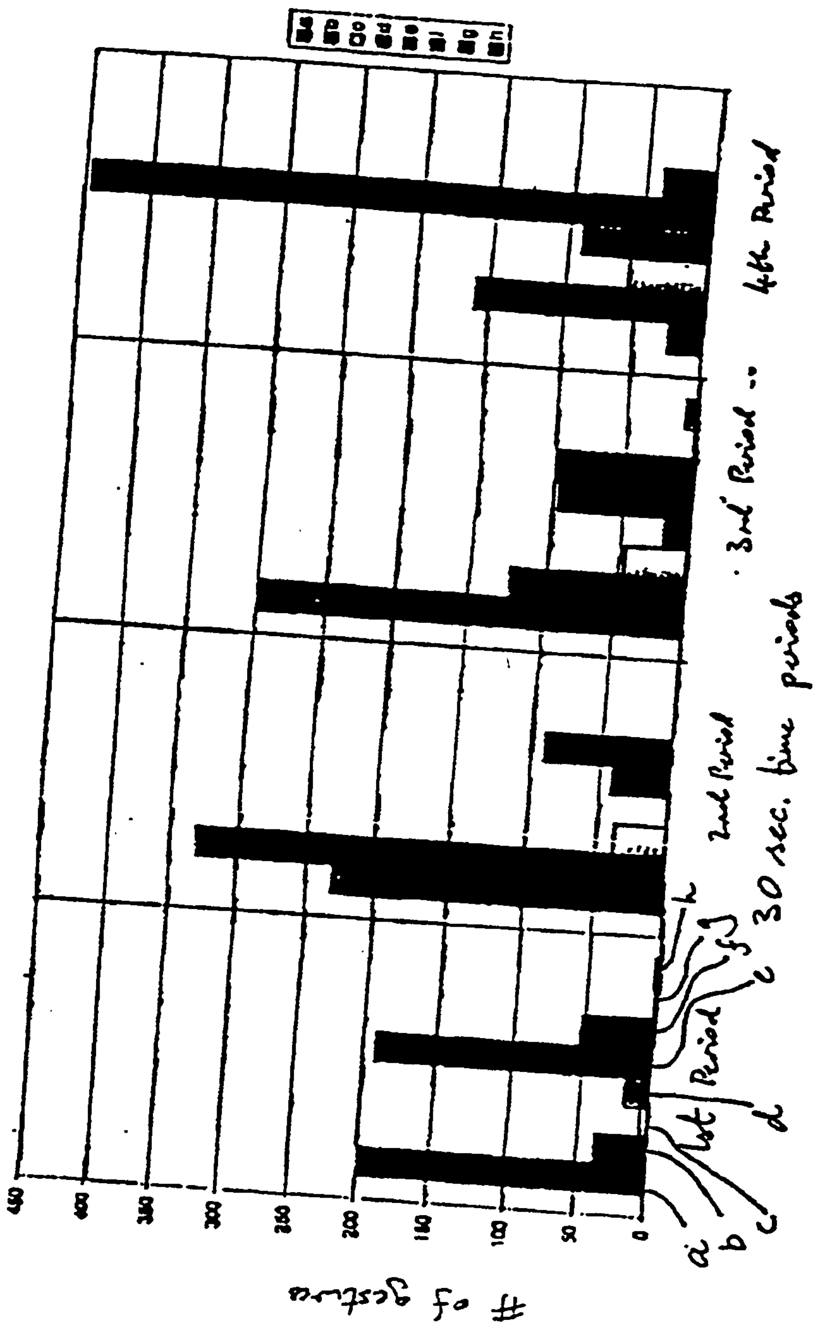


FIG. 14A



# of gestures
0
50
100
150
200
250
300
350
400
450
1st Period
2nd Period
3rd Period
4th Period
30 sec. time periods

FIG. 14B

DATA GLOVE

BACKGROUND OF THE INVENTION

[0001] The present invention is directed generally to an apparatus and method for detecting motion of parts of a body and more particularly to a lightweight instrumented fabric and its use

[0002] A data glove is generally a glove that fits over at least a part of a user's hand and detects movement of the user's fingers and/or thumb. Data gloves are commonly used for controlling computer games and in robotics, including medical robotics. Data gloves may also be used for motion capturing. For example, motion capturing is used in the capturing in the entertainment industry when the motions of a number of points on a hand are recorded in a computer, and the recorded motions then transferred to an animated hand in order to impart a greater sense of reality to the animation.

[0003] Data gloves have been implemented using several different approaches, including mechanical rods and linkages attached to the glove's joints to detect movement thereof. However, conventional data gloves suffer from several problems. First, they can be mechanically unstable, i.e. the sensors within the gloves that detect the movements of the fingers change their local position when the fingers move. Consequently, the sensitivity of the sensors to movement of the fingers changes, and the results may not be repeatable.

[0004] Second, conventional data gloves can be awkward for the user to operate because the sensors used in the glove for detecting finger movement also obstruct the movements of the hands and fingers. Therefore, the range of motion which can be measured can be limited, thus reducing the utility of the glove.

[0005] Third, the sensors employed in conventional data gloves can be complex, and not amenable to production by efficient industrial methods. Consequently, the fabrication of the sensors is expensive and the cost of the data glove is thereby increased.

[0006] Last, the glove may be uncomfortable for the user. Often the glove is made of a heavy rubber and there is a build up of sweat inside the glove. Also, as a result of the weight of the glove and the sensors, the user may tire very quickly, and it is common for a user to have to take a rest from using the glove after only several minutes' use. Therefore, conventional gloves are not suitable for applications that require the glove to be used for over a prolonged time.

[0007] There is therefore a need to produce a data glove where the sensors are stable, where the sensors do not obstruct movement and contribute significant weight to the glove, and which are amenable to cost efficient production techniques. There is also a need to produce a glove which is light in weight, comfortable to wear and which can be used for a prolonged duration.

SUMMARY OF THE INVENTION

[0008] Generally, the present invention relates to a motion detector for detecting the movement of parts of a user's body. In one particular embodiment, the invention is directed to a sensor material for fabricating instrumented clothing, where the sensor material includes an electrically insulating rubber matrix layer with electrically conducting particles disposed within the rubber matrix layer to form a conducting rubber layer. Two electrodes are disposed within the rubber matrix layer, connectable to an external circuit and separated by a separation distance to form an electrical path from one electrode to the other through an intermediate portion of the conducting rubber layer. The electrical resistance measured between the electrodes is indicative of strain in the intermediate portion of the conducting rubber layer, thus permitting measurements of movement of the fabric to be made.

[0009] The fabric may be used to form articles that a user can wear. In another particular embodiment, the invention is directed to a data glove formed of flexible textile material, a portion of which has inner and outer layers. A layer of sensors is situated between the inner and outer textile layers.

[0010] An advantage of the invention is to permit a data glove to detect all finger movements of the human hand, where the glove can be manufactured using simple industrial processes, and which can be worn easily and comfortably by the user. Another advantage of the invention is that a data glove that gives reproducible measurements of hand and finger movements.

[0011] Another advantage of the invention is that sensors are positioned in a rubber matrix forming part of the article worn by the user, so that the sensors remain constantly in the same position relative to the user's body. Additionally, the article worn by the user may be formed to be lightweight and to permit normal perspiration from the body. Consequently, the user remains comfortable and does not tire quickly while wearing the article.

[0012] The above summary of the present invention is not intended to describe each illustrated embodiment or every implementation of the present invention. The figures and the detailed description which follow more particularly exemplify these embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The invention may be more completely understood in consideration of the following detailed description of the various embodiments of the invention in connection with the accompanying drawings, in which:

[0014] FIG. 1 illustrates a perspective view of a data glove according to one embodiment of the present invention;

[0015] FIG. 2 illustrates a sectional view through a rubber matrix portion of the data glove, showing conductive particles inserted within the matrix;

[0016] FIG. 3A illustrates a section through one embodiment of the data glove, showing a sensor system having a number of laminations through the glove;

[0017] FIG. 3B illustrates a section through a portion of another embodiment of the data glove showing electrodes embedded within a rubber matrix as sensors;

[0018] FIG. 4A illustrates a plot of voltage drop across a portion of sensor material plotted against stress in the sensor material;

[0019] FIG. 4B illustrates repeatability of a number of measurements as in FIG. 4A;

[0020] FIG. 5A illustrates a sensor stripe using helical electrodes;

[0021] FIG. 5B illustrates a data glove incorporating a number of sensor stripes of the form illustrated in FIG. 5A;

[0022] FIG. 6 illustrates an exploded view of different layers of one embodiment of the data glove;

[0023] FIG. 7 illustrates a system for acquiring, measuring and analyzing data produced by the data glove;

[0024] FIG. 8 illustrates the degrees of freedom of the hand that can be measured by a data glove;

[0025] FIG. 9 illustrates a block schematic diagram for data logger and transducer bank;

[0026] FIG. 10 illustrates a general view of a master-slave system incorporating the data glove;

[0027] FIGS. 11A to 11C illustrate various configurations for obtaining data from the data glove;

[0028] FIG. 12 illustrates a computer display screen for a computer game using gesture control from the data glove;

[0029] FIG. 13 illustrates a number of hand gestures detectable by the data glove; and

[0030] FIGS. 14A and 14B illustrate different presentations of logged data produced by the data glove.

[0031] While the invention is amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. However, it should be understood that the intention is not to limit the invention to the particular embodiments described. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention and is defined by the appended claims.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0032] The present invention is directed to an instrumented fabric that can be formed into articles worn by a user to detect motion of various parts of the user's body While these articles worn by the user may take many different forms and be used to detect the motion of many different parts of the user's body, the description of the invention is directed to an embodiment of that includes a data glove in order to help the reader understand the full scope and applicability of the invention. The use of a data glove as an example is not intended to limit the scope of the invention, which is set out in the claims.

[0033] FIG. 1 illustrates a general view of a data glove. The data glove 100 is formed of a flexible material that fits to the human hand 106 like a normal glove. The flexible material may include a rubber layer. The rubber layer includes one or more sensors positioned strategically on the glove to detect various motions of the user's hand and digits, such as flexion of a finger joint. The rubber layer may extend partially or completely throughout the glove 100. The glove is provided with fingers 104 and a cable connection 102 so that data generated by the sensors may be transmitted to a signal analyzer. The glove 100 may also include a fastener 108 for holding the glove firmly in place on the user's hand 106. The fastener 108 may be of the hook and loop type, commonly known as VELCRO.

[0034] FIG. 2 illustrates a cross section through a portion of an electrically conductive rubber layer, such as may be used in the glove 100. The conductive rubber layer 204 includes a rubber matrix 200, which may be a conventional electrically insulating rubber, a liquid silicon rubber (formed by a vulcanization at high temperatures), or an RTV silicon rubber (room temperature vulcanized). As an example, Silopren 2530, manufactured by Beyer Corp. may be used for the rubber matrix 200.

[0035] Electrically conductive particles 202 are inserted in the rubber matrix 200. These particles 202 may be all be formed from the same material, or from different materials, and may have the same or different sizes. The electrically conductive particles may be, for example, carbon (graphite), titanium or aluminum or other metal particles. Additionally, the particles may be a mixture of, for example, carbon, titanium and graphite. The electrically conductive particles 202 may be surrounded with primers (bonding agents). The electrically conductive particles 202 are mixed into the liquid rubber before it is vulcanized to form the rubber matrix 200. The conductivity of the rubber layer 204 arises from the conductive particles 202.

[0036] As an example, an RTV silicon may be mixed with 5%-8% graphite powder. Preferably the fraction of graphite powder (e.g. Desire Vuntex L, or CA2) is 6%-7%, and more preferably the fraction of graphite powder is approximately 6.4%. 2%-3% of a vulcanization terminating agent (e.g. Beyer AC 3349) may also be added to maintain the flexibility of the silicone. The vulcanization terminating agent may be a cross-linking terminator or capper, or a chain terminator or capper.

[0037] Rubber formed in this manner manifests an electrical resistivity that is dependent on the strain applied to the rubber matrix 200. This is illustrated in FIG. 4A, which shows the voltage drop measured across a sample of electrically conductive rubber as a function of strain from zero to 15 mm. FIG. 4B shows a similar plot of voltage drop against strain for the sample. The four curves represent different cycles in which the sample was strained: the voltage drop is plotted for each cycle to show the repeatability of the sensor's voltage drop. The unstretched rubber had a resistance of approximately 5 kΩ between electrodes separated by 2.5 cm.

[0038] FIG. 3A illustrates a first embodiment of a sensor used in the glove 100 to detect motion of a digit. The figure illustrates a section through the material of the glove 100, between an outer isolating layer 300 and an inner isolating layer 302. The glove material includes two layers of electrically conductive rubber 304, separated by an isolation foil 306. A metallic foil 308 is provided on one side of the isolation foil 306. A gap 310 formed in the metal foil 308 is filled with another layer of insulation 312. A pair of insulation gaps 314 expose parts of the upper surface of the metallic film 308 to the conductive rubber 304. These exposed portions 320 of the metallic film 308 act as electrodes. The left portion of the metallic film 316 is electrically isolated from the right portion of the metallic film 318 except for the electrically conducting path from the electrodes 320 through the electrically conductive rubber 304. The metallic foil 308 is connected to a system (not illus-

trated) for measuring the resistance around an electrical circuit that includes the metallic film 308 and that portion of the electrically conductive rubber 304 lying between the electrodes 320. If the glove material is stretched in a lateral direction 322, for example by flexing of a finger, then the conduction path between the electrodes 320 changes, thus changing the electrical resistance measured. For example, if the length of the conduction path increases, e.g. through stretching the rubber, then the electrical resistance also increases. Conversely, if the length of conduction path is decreased, for example by compression of the rubber, then the resistance falls.

[0039] In another embodiment, illustrated in FIG. 3B, the glove material includes outer and inner insulating layers 330 and 332. A layer of electrically conducting rubber 334 is disposed between the outer and inner insulating layers 330 and 332. Helically wound, isolated wires 336, also called electrodes, are disposed within the electrically conductive rubber 334. Each electrode 336 includes a wire surrounded by a layer of insulation 338, and a bared metal tip 340. The electrodes 336 may be connected to an external circuit (labeled as "C", not shown) so that current flows between the pair of bared metal tips 340 through the conducting rubber 304. The circuit may be included in a system for measuring electrical resistance. When the glove material is stretched or compressed, for example under flexion of knuckle, the distance separating the bared metal tips 340 changes, and there is a concomitant change in electrical resistance.

[0040] Although the electrodes 336 are not required to be helical, the helical shape is advantageous in allowing the electrodes 336 to bend and stretch with the rubber layer 334, while preventing the electrodes 336 from slipping from their positions within the layer 334. It will be appreciated that other arrangements may be used for ensuring that the relative movement between the electrodes 320 and 336 results from stretching the rubber layer 304 and 334, and does not arise from the electrodes slipping within the layer. For example, the end of the electrode 336 close to the metal tip 340 may be anchored in the rubber layer 334 using a collar or the like.

[0041] A rubber sensor layer having sensors disposed within the layer as illustrated in FIGS. 3*a* and 3*b* may be thin, for example 0.5 to 1 mm thick. Such a thin layer advantageously permits the glove to be flexible and reduces any limitations on the range of permissible glove movement. Also, such a thin layer reduces the weight of the data glove, thus allowing the user to operate the data glove for extended periods of time without undue fatigue.

[0042] FIGS. 5A and 5B illustrate the application of a helical electrode type sensor to a glove. A sensor strip 500 is shown in FIG. 5A. The sensor strip includes two helical electrodes 502 and 504, having respective bared tips 506 and 508 separated by a distance d. The helical electrodes 502 and 504 are isolated from the environment by the outer and inner layers of the strip 500. A measurement of the electrical resistance across the end points 510 and 512 of the respective helical electrodes 502 and 504 provides a measure of the resistance, and therefore the distance, between the tips 506 and 508. Lateral stretching of the strip 500 in the direction 514 results in an increase in the measured resistance.

[0043] FIG. 5B illustrates the formation of a data glove by applying a number of sensor strips to an uninstrumented glove 520. The uninstrumented glove 520 includes four fingers 522, 524, 526, 528, and a thumb 530. Four sensor stripes 532, 534, 536 and 538 are applied to the back of the uninstrumented glove 520 and respective fingers 522, 524, 526, and 528 to produce an instrumented glove. Additionally, a thumb stripe 540 is applied on the back of the glove 520 and the thumb 530. To explain how the data glove works, consider that a user is wearing the glove 520. Flexion of the forefinger 522 results in a change in resistance measured in the respective forefinger stripe 532. This change in resistance may be detected by a control unit (not illustrated) and identified as a movement of the forefinger 522. Additionally, a transverse stripe 542 may be placed across the back of the glove 520 for detecting abduction, i.e. the spreading of the fingers 522, 524, 526, and 528 relative to one another.

[0044] It will be appreciated that each strip 532, 534, 536, 538, 540 and 542 may be provided with more than one sensor to detect motion at more than one position the glove 520. For example, the finger strips 532, 534, 536, and 538 may each be provided with three or more sensors, with at least one sensor being placed on a respective strip to sense the movement of a corresponding finger joint. Thus, the glove may be instrumented to detect motion of each joint, individually and independently. Additionally, the sensors may be disposed on individual strips attached to the glove, or may be disposed on a single layer attached to the glove.

[0045] FIG. 6 illustrates another embodiment of a data glove. The hand 600 is surrounded by an inner glove portion having an upper portion 602 and a lower portion 604. The upper and lower portions 602 and 604 are illustrated to be separated, but it will be appreciated that the inner glove forms a single unit into which the user inserts his or her hand. A supporting layer 606 is disposed on the upper portion 602. A resistive rubber sensor layer 608 is disposed on the first isolating layer 606. A network of electrical cables 610 makes connections through the sensors in the sensor layer 608, and permits connection to a control unit (not illustrated). A second isolating layer 612 is disposed over the cable network 610. An outer layer 614 may be disposed on the second isolating layer 612. The outer layer may, for example, feature a design or the like indicative of the type of glove or the manufacturer thereof.

[0046] It will be appreciated that the sensor layer 608 may include a number of stripes having helically coiled electrodes, or may include laminated sensors as illustrated in FIG. 3A. It will further be appreciated that the sensor layer may be provided on either the dorsal (back) surface of the glove or the volar surface (the palm surface), or both. An advantage of placing the sensor layer on only one surface of the hand is that the other surface may breath through the fabric of the glove, thus increasing the user's comfort.

[0047] FIG. 7 illustrates one particular embodiment for recording and analyzing data produced by the data glove 700. Data from the data glove 700 are transmitted to a signal recording and conditioning unit 702. The recording and conditioning unit 702 receives resistance data from each of the sensors in the glove 700, and converts these signals into signals representative of the magnitude of extension detected by each sensor. These conditioned signals may then be directed through an interface 704 to a computer 706. The interface 704 may be, for example, an RS232 serial inter-

face. It will be appreciated that the computer 706 may be a PC compatible type computer, Macintosh compatible computer, a UNIX based workstation, or any other type of computer.

[0048] The glove 700 may also be provided with a position sensor 710 which determines the position of the glove within a prescribed area, such as a room. A position sensor may be based on the detection of an electromagnetic or ultrasonic signal to determine position within the room. For example, an electromagnetically based sensor may have x, y, and z antennas for detecting x, y, and z, radiated signals. A measurement of the strength of the detected signals provides information on the distance from the transmitters. The position sensor 710 transmits position data through an interface 708 to the computer 706. The interface 708 may be, for example, an RS232 serial interface.

[0049] FIG. 8 illustrates the degrees of freedom (DOF) of the hand which may be measured using a data glove of the present invention. The figure illustrates four fingers, the index finger, the middle finger, the ring finger, and the pinkie finger, and the thumb. Black dots represent joints between adjacent finger bones. The dots marked 802 represent the joint between the distal phalanx and the middle phalanx of each finger (the distal interphalangeal joints). The dots marked 804 represent joints between the middle phalanx and the proximal phalanx of each finger (the proximal interphalangeal joints). The dots marked 806 represent the joints between the proximal phalanx and the metacarpal bone of each finger (the metacarpophalangeal joints).

[0050] The joint between the proximal phalanx and the distal phalanx of the thumb is marked 812 (the thumb interphalangeal joint), the joint between the proximal phalanx and the metacarpal bone of the thumb is marked as 814 (the thumb metacarpophalangeal joint), and the joint between the thumb metacarpal and the trapezium is marked as 816 (the trapeziometacarpal joint).

[0051] The data glove may provide a sensor for detecting flexion of the joint between the distal and middle phalanges of each finger, and also flexion of the joint between the middle and proximal phalanges of each finger. The numbers "1" indicate the number of types of movement detected at specification locations on the hand. Thus, where only flexion is measured, number "1" is shown.

[0052] The numbers "2" shown by the joints between the proximal phalanx and metacarpal of each finger 806 indicate that both flexion and abduction of these joints may be measured.

[0053] On the thumb, flexion may be measured on the joint between the distal and proximal phalanges 812, and the joint between the proximal phalanx and the metacarpal 814. However, since the thumb is opposable, there are three types of motion which may be measured at the joint between the metacarpal and the trapezium 816. These movements are flexion, abduction and rotation. Rotation is also known as opposition or circumduction.

[0054] Data representing movements at all of these joints may be transmitted to a tracking system. An example of a circuit that may be used in signal acquisition, conditioning and analysis is illustrated in FIG. 9. Sensor resistance measurement functions are illustrated under the "signal conditioning" portion, labeled as 900. Signal analysis, including analog to digital conversion, and circuit control functions are illustrated under the "analyzer and control" portion, labeled 902.

[0055] The glove is assumed to have a number, n, of sensors 904. Each sensor 904 is connected to a demultiplexer 906 and a multiplexer 908. In one particular embodiment, the demultiplexer 906 and the multiplexer 908 are controlled by a processor 918 to selectively connect one of the sensors 904 with one of a number of measurement resistors 912. A programmable measurement resistor selector 910 is controlled by the processor 918. The voltage signal across the measurement resistor 912 is indicative of the resistance of the sensor selected by the demultiplexer 906 and multiplexer 908. The voltage signal is fed into an amplifier 914 before being converted to a digital signal in an analog-to-digital converter 916. The digitized signal is then transferred to the processor for further processing and analysis, or for transferring through an interface 920 to, for example, a computer.

[0056] The processor 918 controls the demultiplexer 906, the multiplexer 908 and the programmable measurement resistor selector 910 so as to sample the resistance of the sensors 904, or selected sensors 904, at regular intervals. When the sensor is strained over a large range, the voltage signal fed to the amplifier 914 increases. The processor 918 selects a measurement resistor 912 according to the amount of strain in the sensor 904 being measured, so that the voltage signal fed to the amplifier 914 remains within predetermined limits.

[0057] FIG. 10 illustrates a "master-slave" method of imaging the movements of a hand. The hand is contained within the data glove 1000, and data from sensors within the glove 1000 are conditioned in a signal conditioner 1002. The data from the signal conditioner 1002 are transmitted over a cable 1004 to an analyzer 1006. Analyzed data are then transmitted over an interface 1008 to a computer 1010. The computer 1010 is connected to a video monitor 1012. The computer 1010 may be configured to display an image of the hand 1014 that corresponds to the information transmitted from the glove 1000. Accordingly, the image of the hand 1014 may show movements that correspond to movements of the users hand within the glove 1000. It will be appreciated that the glove 100 may also act as a mast to control a robot hand operating as a slave. The robot hand may be connected to the data glove 1000 through a computer or other electronic circuit, so that the robot hand is controlled to produce movements corresponding to the movements detected by the data glove 1000.

[0058] FIGS. 11*a*-11*c* illustrate different arrangements for connecting a data glove to a computer. In FIG. 11*a*, a data glove 1100 is provided with a signal conditioner 1102. The signal conditioner 1102 may be small and positioned on the back (dorsal) surface of the glove 1100 in a position where it causes little or no interference with the movements of the user's hand within the glove 1100. The glove may be provided with a strap 1104, fastener or the like to fit the glove 1100 tightly to the user's hand. A cable 1106 connects the signal conditioner 1102 to a signal analyzer 1108. The signal analyzer 1108 may include an analog-to-digital converter and a processor. The signal analyzer 1108 is connected through a second cable 1110 to a computer 1112, such as a PC, Macintosh, Unix workstation or the like.

[0059] Another arrangement for connecting the data glove 1100 to a computer is illustrated in FIG. 11*b*. Here, the computer 1124 includes an extension card 1122. The card 1122 includes a signal analyzer 1120 which is connected to the signal conditioner 1102 via the cable 1106.

[0060] In another arrangement for connecting the data glove 1100 to a computer, illustrated in FIG. 11c, the signal conditioner 1134 is removed from the glove 1100, and is connected thereto through a cable 1132 and connector 1130. The signal conditioner 1134 is connected via a second cable 1136 to the signal analyzer 1120 on the extension card 1122 within the computer 1124.

[0061] FIGS. 12 and 13 illustrate that the data glove may be used as an interface between a user and a computer for operating a computer game. FIG. 13 illustrates 8 different gestures that may be made by a hand inside a data glove. Each of these gestures may be associated with a particular instruction for a computer game. For example, a gesture in which the thumb and index finger are extending and the remaining fingers are folded may be used to represent an instruction to move forwards (gesture a)). A gesture in which the thumb and the index and middle fingers are extending may be used to represent an instruction to move backwards (gesture b)). A gesture in which the middle and ring fingers are folded and remaining fingers and thumb extending may be used to represent movement in one direction, for example, the right (gesture c)). A gesture in which all the fingers except the ring finger are extended, along with the thumb may represent an instruction to move to the left (gesture (d)). A gesture in which all fingers and the thumb are extended, except for the ring finger, may represent an instruction to rotate to the right (gesture e)). A gesture in which all fingers and the thumb are extended, except for the index finger, may represent an instruction to rotate to the left (gesture f)). A gesture in which all four fingers are extended and the thumb is folded may represent an instruction asking for help (gesture g)), and a gesture in which all fingers are folded and the thumb is extended may represent an "OK" command (gesture h).

[0062] It will be appreciated that various other gestures may be made by a hand wearing a data glove, and that these gestures may be used to represent additional commands. It will also be appreciated that the correlation between gestures and commands shown in FIG. 13 may be different.

[0063] Such a range of commands may be used to control a computer game such as is shown in FIG. 12, in which the user sees a screen 1200 which shows a virtual world having a number of different walls 1202 that create a virtual maze through which the user has to negotiate. A bar 1204 at the bottom of the screen illustrates a number of gestures associated with different commands. The bar 1204 on the lower edge of the screen 1200 may include a window 1206 that illustrates the current gesture detected from the glove. It will be appreciated that many computer games in which the user has to supply control commands to the computer may be controlled through the use of a number of gestures detected from a data glove.

[0064] FIGS. 14A and 14B illustrate statistical analyses of a number of gestures performed by a user over a period of time. For each graph, a user repeatedly performed the gestures illustrated in FIG. 13. The individual gestures were logged by a computer and a tally of how many times the user performed each gesture was kept. FIG. 14A illustrates a cumulative total of the number of each type of gesture after 10, 20 30 etc. seconds. For example, after 50 seconds, the user had made approximately 425 gestures of type a), 370 gestures of type b) and less than 10 gestures of type c). After 90 seconds, the user had made gesture a) approximately 720 times, gesture b) approximately 490 times and gesture c) approximately 90 times. FIG. 14B illustrates the number of each type of gesture performed by the user in different 30 second intervals. For example, in the first interval of 30 seconds, the user performed 200 a) gestures and about 40 b) gestures, while in the second interval he performed about 230 a) gestures and about 330 b) gestures.

[0065] The information developed by the data glove and illustrated in FIGS. 14A and 14B may be useful for determining the physical performance of someone performing a critical task, such as an astronaut or a soldier. For example, a supervisor or supervising computer may monitor the movements of a particular individual performing a task. The different types of movements, or gestures, may be logged and compared to a reference dataset previously acquired for that individual, in which the individual's state of fatigue is correlated with the number of times different movements or gestures have been performed. Once the actual number of movements approaches a number previously determined to indicate that the individual is becoming fatigued, then the commander or controlling computer may indicate to the individual that it is time to rest. In illustration, it may have been previously determined in control experiments that the individual is able to perform no more than 350 gestures of type e) in a 30 second period without any significant fatigue occurring. However, in the fourth 30 second period shown in FIG. 14B, it is seen that the individual performs almost 450 e)-type gestures. Thus, the individual may be warned after the fourth 30 second period to take a rest because fatigue is likely to occur.

[0066] It will be appreciated that the motion of many different body parts may be detected and analyzed using sensors of the type disclosed herein. For example, rather than a glove, the user may wear a sleeve to detect movements of the elbow, or a shoulder harness to detect movements of the neck and shoulders. Sensors of this type may be fabricated to fit almost all of the moveable body parts, including but limited to fingers, hands, wrists, elbows, shoulders, neck, torso, hips, knees, ankles, feet and toes. It is also possible to combine sensors for different parts of the body. For example, a whole body sensor suit may monitor the movement of ankles, knees, hips, torso, shoulders, elbows and wrists, or may include sensors to monitor motion of another combination of body parts. Such a suit fits tightly over the selected body parts so that the sensors remain in place relative to the particular joints, limbs etc. that are to be monitored. For example, such a suit may be worn by an astronaut to allow mission control to monitor the astronaut's progress and movements during an exacting spacewalk mission. Comparison of the astronaut's movements with reference data taken from control experiments may indicate to doctors or mission control specialists when the astronaut is likely to become fatigued and, therefore, less effective.

[0067] While various examples were provided above, the present invention is not limited to the specifics of the examples. For example, the glove fitting around the hand may not be a full glove, but may have only partial fingers,

for example extending from the hand to the second knuckle. The use of such a partial glove permits a user to sense movement of a reduced number of finger joints.

[0068] As noted above, the present invention is applicable to a glove for detecting motion of fingers and the thumb of a hand. While having use in many different applications, it is believed to be particularly useful for controlling computer games. Accordingly, the present invention should not be considered limited to the particular examples described, but rather should be understood to cover all aspects of the invention as fairly set out in the attached claims. Various modifications, equivalent processes, as well as numerous structures to which the present invention may be applicable will be readily apparent to those of skill in the art to which the present invention is directed upon review of the present specification. The claims are intended to cover such modifications and devices.

1. A data glove for use with a user's hand, comprising:

a glove portion fittable on the user's hand, the glove portion having an inner layer portion;

a sensor layer integrally attached to an outer surface of the inner layer portion for movement therewith, the sensor layer including a strain sensor embedded within a conductive rubber matrix and including a metal foil having a first gap therein, the first gap filled with an insulating material, a first electrically insulating material contacting a first surface of the metal foil, a second electrically insulating material contacting a second surface of the metal foil, and the conductive rubber matrix contacting the second electrically insulating material, wherein the second electrically insulating material is formed with at least a second gap to expose portions of the second surface of the metal foil to the conductive rubber matrix to conduct an electrical current between the exposed portions of the metal foil through the conductive rubber matrix; and

an information port connected to the strain sensor, the information port being connectable to an external circuit.

2. A data glove according to claim 1, wherein the at least one stress sensor includes two insulated electrodes embedded within the conductive rubber matrix so as not to slip within the rubber matrix, the electrodes having mutually opposing bare wire ends separated within the rubber matrix by a preselected separation distance.

3. A data glove according to claim 1, wherein the at least one stress sensor includes a metal foil, the metal foil having a first gap therein, the first gap filled with an insulating material, a first electrically insulating material contacting a first surface of the metal foil, a second electrically insulating material contacting a second surface of the metal foil, and the conductive rubber matrix contacting the second electrically insulating material, wherein the second electrically insulating material is formed with at least a second gap to expose portions of the second surface of the metal foil to the conductive rubber matrix so that an electrical current is flowable between the exposed portions of the metal foil through the conductive rubber matrix.

4. A data glove according to claim 1, wherein the sensor layer includes a sensor strip provided on a finger of the glove portion having the at least one sensor to detect flexion of the glove finger.

5. A data glove according to claim 1, wherein the sensor layer includes a sensor strip provided across a back portion of the glove portion to detect abduction of a glove finger.

6. A data glove according to claim 1, wherein the sensor layer is provided at least partially on a posterior surface of the glove portion.

7. A data glove according to claim 1, wherein the sensor layer is provided at least partially on a volar surface of the glove portion.

8. A data glove according to claim 1, wherein the sensor layer includes sensors to sense flexion of first, second, and third knuckles of a user's finger, and abduction of the user's finger.

9. A data glove according to claim 1, wherein the sensor layer includes sensors to sense flexion, abduction, and rotation of the user's thumb.

10. A data glove according to claim 1, further comprising a computer connected to the information port to analyze sensor data produced by the at least one sensor.

11. A data glove according to claim 10, wherein the computer further includes a monitor adapted to display an image of a hand under control of the computer, and the computer controls the image of the hand to move in a manner corresponding to movements of the user's hand detected by the sensor layer.

12. A data glove according to claim 10, wherein the computer is configured to recognize gestures made by the user's hand in the data glove and to interpret the gestures as computer commands.

13. A data glove according to claim 12, wherein the computer is operable to run a computer game and the gestures recognized by the computer include commands to direct the computer game.

14. A data glove according to claim 1, wherein the electrical connector is connected to a signal conditioning unit to produce a conditioned signal corresponding to a strain signal received from the at least one sensor.

15. A data glove according to claim 14, further comprising a signal analyzer, including an analog-to-digital converter, and a computer, wherein the conditioned signal is received by the signal analyzer to produce a digitized signal in response to the conditioned signal, and the computer receives the conditioned signal.

16. A data glove according to claim 1, further comprising a position sensor movable with the glove portion so as to determine position of the user's hand within a defined space.

17. A sensor material for fabricating instrumented clothing, comprising:

a rubber matrix layer impregnated with electrically conducting particles to form a conducting rubber layer, the conducting rubber layer:

first and second insulating outer layers disposed on respective first and second surfaces of the conducting rubber layer; and

two metal electrodes disposed within the rubber matrix layer, connectable to an external circuit and separated by a separation distance to form an electrical path from one electrode to the other through an intermediate portion of the conducting rubber layer;

wherein the electrical resistance measured between the electrodes is indicative of strain of the intermediate portion of the conducting rubber layer.

18. A sensor material according to claim 17, wherein each electrode comprises an insulated metal wire having a bared metal tip, the bared metal tips being mutually opposed.

19. A sensor material according to claim 17, further comprising a metal foil, the metal foil disposed within the rubber matrix layer, connectable to an external circuit and having a first gap therein, the first gap being filled with a gap insulating material, a first electrically insulating material layer contacting a first surface of the metal foil, a second electrically insulating material layer contacting a second surface of the metal foil, and the conductive rubber matrix contacting the second electrically insulating material, wherein the second electrically insulating material has at least a second gap to expose portions of the second surface of the metal foil to the conductive rubber matrix, the exposed portions of metal foil forming the electrodes.

20. A sensor material according to claim 17, further comprising first and second insulating outer layers disposed on respective first and second outer surfaces of the conducting rubber layer.

* * * * *

APPENDIX D

BARASCH – U.S. PATENT NO. 3,761,965

United States Patent [19]

Barasch

[11] **3,761,965**

[45] **Oct. 2, 1973**

[54] **SEAMLESS PLASTIC ARTICLES HAVING A TEXTURED SURFACE**

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[73] Assignee: **Becton, Dickinson and Company**, East Rutherford, N.J.

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[21] Appl. No.: **263,771**

[52] **U.S. Cl.** **2/167**

[51] **Int. Cl.** **A41d 19/00**

[58] **Field of Search** 2/159, 161, 167, 2/168, 20, 16

[56] **References Cited**

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Primary Examiner—Geo. V. Larkin
Attorney—David S. Kane et al.

[57] **ABSTRACT**

Impermeable relatively thin resin film having a granular textured surface which is adapted to be made into articles such as surgeons' gloves is disclosed. The films are made from liquid dispersions of vinyl chloride polymers in a suitable plasticizer. The liquid dispersion or plastisol is applied to a suitable form to provide film of the resin dispersion thereon. The resin film is heat set and has applied thereto in a non-uniform distribution particles of a granular vinyl chloride polymer which becomes embedded therein, then the film is heat cured thereby forming a film having a granular textured surface.

6 Claims, 3 Drawing Figures

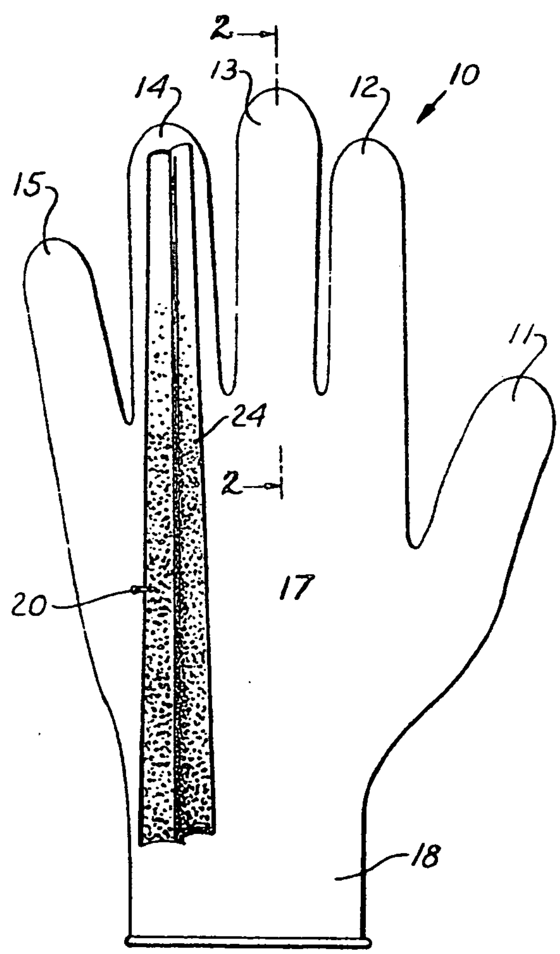


Fig. 1

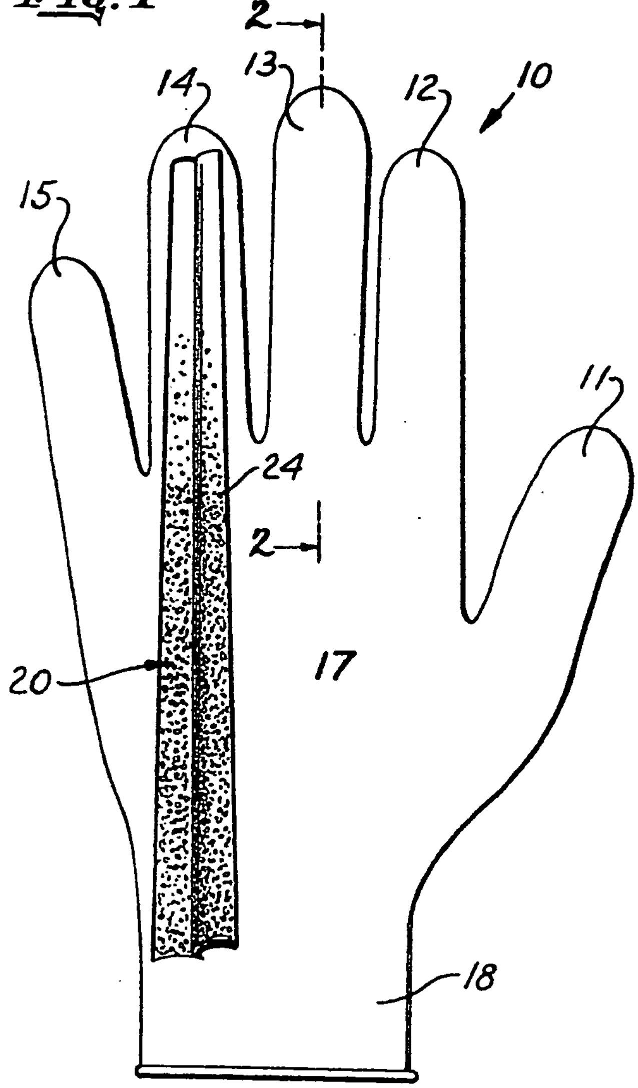


Fig. 2

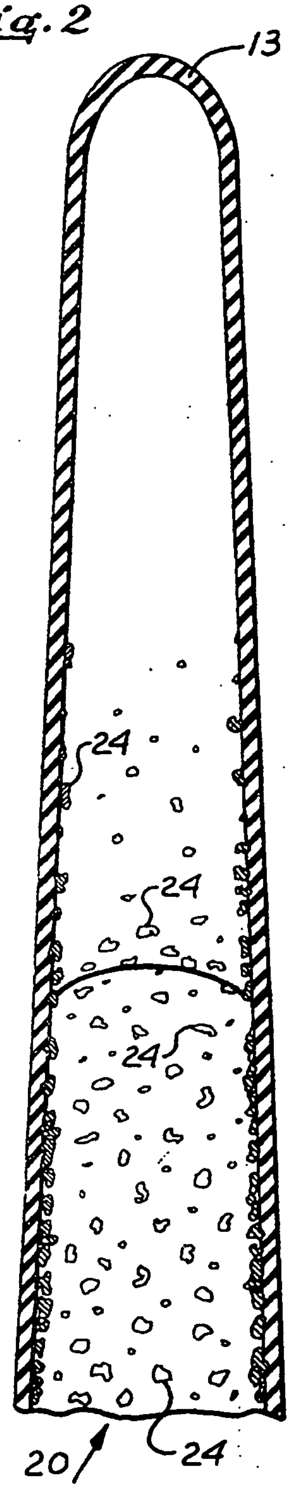
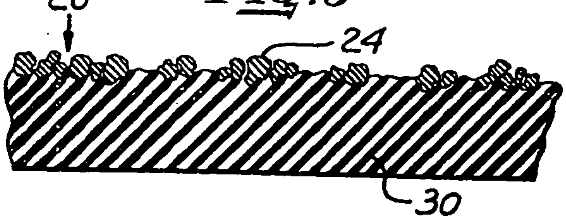


Fig. 3



SEAMLESS PLASTIC ARTICLES HAVING A TEXTURED SURFACE

BACKGROUND OF THE INVENTION

It is known for example to prepare a disposable sanitary glove in which the glove is formed of a film having a textured surface. See U. S. Pat. No. 3,072,914. However, this patented teaching employs the step of incorporating all of the raw materials in the liquid plastisol in which the texturizing particles of granular material, is also included. It has been found that minute pinholes and a weakening of the film occurs. Obviously, if pinholes are present, the material is not suitable for use as a surgeon's glove.

It is also known to make seamless plastic gloves having textured surfaces in which textured surfaces is formed of granular material. The size of the particles are of a greater diameter than the desired average thickness of the finished glove. However, as stated before, pinholes have been found to form in the film and therefore are not suitable for surgeons' gloves, see U. S. Pat. No. 3,148,235.

Other plastic sheet material having textured surfaces are disclosed in U. S. Pat. No. 3,585,099. However, the disclosure relates to making the plastic sheet on a substantially flat horizontal surface in which the sheet is textured, for example, for use as automobile carpets. It is not concerned with relatively thin textured films. It is also known to provide plastic films with textured surfaces for floor tiles. See U. S. Pat. No. 3,152,002.

SUMMARY OF THE INVENTION

With the foregoing in mind, it is an object of the invention to provide an impermeable plastic film having a textured surface which is formed in situ and to the method for making the same. It is another object of the invention to provide a seamless plastic glove or similarly molded article in which it is not necessary to maintain stringent controls on the granular resin particle size with respect to the film thickness.

It is another object of the invention to provide a textured surface which is achieved without embossing or molding confinement or pressure and desired film thickness and degree of coarseness is achieved by proper selection of resin granule size.

Still another object of the invention is to provide a textured seamless glove which can be thereafter packaged, stored, shipped and when used, conveniently donned without the use of powder.

The invention generally contemplates providing a new and improved process of manufacture for making plastic articles which are textured in situ while the resin film is on the form and in an uncured, gelled state. The article is constituted by a shaped film made from liquid dispersions of vinyl chloride polymers in a suitable plasticizer. A film of the resin dispersion or plastisol is applied to a suitable form such as a hand. The film carried by the shaped form is subjected to a temperature of about 450°F. for a relatively short period of time to heat set the film on the form while maintaining the film in a gelled tacky state. Granular vinyl chloride particles are applied to the gelled form in a non-uniform random distribution. The gelled form is then subjected to a further heat curing step of at least 450°F. for a relatively short period of time but a greater length of time than the initial heat setting step, thereby fully fusing the resin and plasticizer and firmly bonding the vinyl chloride particles into the film. The resulting formed glove is found to be without pinholes has improved strength and the vinyl particles are firmly embedded in the film. The glove is removed from the form and is suitable for donning without the use of a lubricant such as powder.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plane view of an impermeable film in the form of a surgeon's glove in which a portion of the film is peeled away to illustrate the random distribution of particles bonded to the film which form the textured surface.

FIG. 2 is an enlarged, fragmentary, sectional view of a finger stall taken along the line 2—2 of FIG. 1.

FIG. 3 is a greatly enlarged sectional view of a film illustrating the particles bonded in the film in a non-uniform, random distribution.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, a polyvinyl chloride textured glove suitable for donning without the use of a lubricant such as powder is illustrated and is shown as a seamless five fingered surgeon's glove **10**. The glove has five finger stalls, a thumb stall **11**, an index finger stall **12**, a middle finger stall **13**, a ring finger stall **14** and a little finger stall **15**, a palm portion **17** and a cuff portion **18**. A longitudinal section is cut from the glove starting from the cuff portion through the ring finger portion **14** and is peeled away to illustrate the textured surface **20** in which a heavy concentration of granular particles **24** is randomly distributed over palm portion **17** while a thinning out of particles **24** is visibly noticeable and finger stall portions, thus illustrating a non-uniform pattern of random distribution of granular particles **24** on the inner surface of the plastic film of glove **10**.

In FIG. 2, middle finger stall **13** is greatly enlarged to particularly illustrate the non-uniform random distribution of particles **24** and the non-uniform particle size with respect to the film thickness of the film forming stall **13**. The vinyl chloride resin particles **24** are shown randomly distributed within the finger stall **13** in a non-patternwise distribution and in which the particles of the vinyl chloride vary in size. Also, portions of the vinyl chloride particles are shown embedded and bonded in the film of finger stall **13** but do not penetrate therethrough thereby obviating any pinholes forming after the glove is cured.

In FIG. 3 a section of impermeable polyvinyl chloride film is shown having a textured surface **20** in which granular particles of vinyl chloride **24** are embedded therein.

The invention herein may be practiced by dip or spray application of the liquid plastisol onto a shaped form, either directly, or onto an intermediate layer of woven or non-woven fabric if a fabric lining is desired in the finished product. after the plastisol has been applied to the form and the excess material drained therefrom, material is subjected to heating to set the film into a gelled state so that the layer or film of resin adhering to the form will remain tacky and will not be distorted by further gravitational flow along the form, i.e. to maintain substantially uniform film thickness over the form. Then, particles of a resinous material are applied to the form, for example, by passing the form through a spray chamber or by dusting techniques for

dusting particles onto the gelled tacky film surface. The particles will adhere to the gelled tacky film and will become embedded therein. The remaining plasticizer in the gelled film will cause a solvation to take place between the resinous particle and the gelled film to form a weld or bond. Thereafter, the gelled form with the resinous particles embedded therein are subjected to a further heat curing step to permanently bond the particles in the film. Thereafter, the shaped article after cooling is removed from the form and is ready for packaging and for subsequent use.

The resinous material employed in the invention herein may be any suitable, conventional thermoplastic resin, and is preferably a vinyl resin, especially a vinyl chloride resin, as represented by vinyl chloride homopolymer or copolymers of vinyl chloride with such copolymerizable monomers as vinyl acetate and the like. Mixtures of resin for example polyvinyl chloride and vinyl chloride-vinyl acetate copolymer may be used to form a plastisol which is applied as a film to a forming surface such as a glove mold. The plastisol may be applied to the mold in any suitable, conventional manner, such as by spraying or dipping. The plastisol may contain compounding ingredients such as pigments, stabilizers, thickeners or thixotropic agents, etc. The resin of the base layer may be the same as that of the texturizing particles applied thereon, except that the particle size of the plastisol forming resins is generally considerably smaller than that which will provide a granular texture to a surface.

After the resin film is applied to a shaping form such as the glove mold, a measured amount of heat is applied to the mold so that the surface of the plastisol base layer is in a semi-wet, semi-gelled state when the resin particles are applied so that the lower portions of the resin particles become partially embedded in the plastisol layer or film, even without the use of thixotropic agents which are usually not compatible with the low viscosity of plastisols required for making thin-film flexible resinous articles. These particles remain protruding out of the plastisol layer to provide a desired rough texture, or a grain-like surface, which is a consequence of the size and shape of the protruding resin particles.

The resin particles which have been found useful for carrying out tne invention herein are in a form commonly supplied by resin manufacturers. Examples of resin particles are VC 260 C sold by the Borden Company, Marvinol VR 10 sold by the Uniroyal Company, and Exon 666 sold by the Firestone Company, although many other resin particles which are available and are commonly referred to as blending or filler resins are quite suitable. It has also been found that extrusion grade resins may also be used.

In forming the film on the shaped form, it has been found that the average thickness of the film formed when a surgeon's glove is to be made ranges between about 2 to about 5 mils. As noted above, the particle size of the resin forming the plastisol is considerably smaller than the resin particles applied to the gelled surface of the shaped film. It is preferred, however, that the size of the resin particles average less than the average thickness of the film and generally not not exceed 5 mils and preferably between about 0.1 to 4 mils.

By employing the process of the invention herein, particularly in the manufacture of thin films suitable for use as surgeons' gloves, the film forming the glove is continuous and free of pinholes. However, when applying the resin particles to the plastisol according to the prior art and then curing the film with the resin particles uniformly distributed therein, the film contains microscopic discontinuities which are known as pinholes and thus cannot be used as surgeons' gloves due to sterility and contamination problems. This is particularly true when a film thickness lies within the critical range of between 2 to 5 mils. It has also been found when using the gloves made by the process of the invention herein that while the gloves may be donned without employing powder as a lubricant, there is no detrimental effect with respect to tactile sensitivity, frictional or grip characteristics over existing surgical gloves.

For a better understanding of the invention herein, the following example is included to illustrate the aspects of the invention.

EXAMPLE

The following is a formulation for the preparation of a vinyl plastisol for making a so-called featherweight surgical glove of about 9 inches in length and weighing about 5.8 grams with a finger-tip thickness of about 2½ mils, all parts by weight:

	Parts by Weight
Polyvinylchloride powder (Geon 126 by B.F. Goodrich)	100
Dioctyl phthalate (primary plasticizer)	65
Dioctyl Azelate (primary plasticizer)	25
Diisodecyl phthalate (primary plasticizer)	10
Epoxidized Soybean Oil ("Flexol EIP" by Union Carbide — Stabilizer)	3
Organic zinc compound ("Nuostabe V-1260" by Nuodex Corporation — Stabilizer)	3
Phthalocyanine Green (30% active — pigment)	0.2

In the above formulation for the vinyl plasticizer, the amounts of dioctyl phthalate, dicotyl azelate diisodecyl phthalate may vary plus or minus 8 PHR with only minor variation in the resulting properties of the cured film.

After high shear mixing of the above plastisol until a thorough dispersion is obtained, the viscosity of the mixture is about 200 centipoises. The plastisol is maintained at a temperature of about 100°F., the viscosity of which is about 160 centipoises. The shaped forms, for example, a thin-wall mold for a glove is preheated for about 2 minutes at a temperature of 235°F. Then the glove mold is dipped into a tank containing the prepared plastisol and then is removed and allowed to drain for about 2 minutes. The coated mold is then conducted to a heating zone in which it is subjected to a temperature of about 450°F. for about 5 seconds to set the film thereon and form a tacky gell-like material. The mold is then removed from the heating zone and placed in a resin particle application zone, for example, a spray booth, in which a spray of polyvinyl chloride resin VC 260 C is applied to the gelled surface formed on the glove mold so that a non-uniform random dispersion of particles become embedded in the gelled surface. The glove mold carrying the gelled film together with the resin particles of polyvinyl chloride is conducted to a second heating zone to cure the resin at a temperature of 450°F. for about 50 seconds. The cured resin film carried on the glove form is then re-

moved from the heating zone and allowed to cool to room temperature which generally requires about 2 minutes. The cured glove is stripped from the form so that the textured surface becomes the inner surfaces of the glove as shown in FIG. 1 of the drawings.

The foregoing process obviates the necessity of maintaining constant stirring in the plastisol dipping tanks since the large polyvinyl chloride resin granules do not remain suspended in the plastisol. Thus, the plastisol of the invention herein is a stable dispersion and does not settle and further when forming the film on the glove mold an accurate controlled thickness can be maintained since resin granules are not mixed with the plastisol which varies the thickness of the film on the mold and causes pinholes due to uneven distribution of the polyvinyl chloride plastisol.

It is obvious that many plastisol formulations may be made within the skill of the art and other resin particles may be employed for preparing textured gloves or other textured resin particles according to the processes described above. However, it has been found that the particle size of the resin used for making the plastisol should be considerably smaller than the particle size of the resin granules used for forming the textured surface.

I claim:

1. A seamless disposable glove adapted to be donned without the use of powder, said glove comprising an impermeable relatively thin resin film having a textured surface, said film being formed from plasticized polyvinyl chloride and said film having applied thereto a non-uniform distribution of particles of granular vinyl chloride polymer having less than the average thickness of the film, said particles being at least partially embedded therein but not extending through the film thickness so as to provide a textured surface.

2. The seamless disposable glove of claim 1 wherein the textured surface is the inner surface of the glove.

3. The seamless disposable glove of claim 1 wherein the particles applied to the impermeable relatively thin resin film are predominantly concentrated around the palm and cuff portion of said glove and sparsely distributed around the finger stall zones of said glove.

4. The seamless disposable glove of claim 1 wherein said impermeable film thickness is from 2–5 mils.

5. The seamless disposable glove of claim 1 wherein the particle size of the granular vinyl chloride polymer is less than about 5 mils.

6. The seamless disposable glove of claim 1 wherein the particle size of granular vinyl chloride polymer is from about 0.1 to about 4 mils.

* * * * *

APPENDIX E

BARNETT – U.S. PATENT NO. 4,536,890

United States Patent [19]

Barnett et al.

[11] **Patent Number: 4,536,890**

[45] **Date of Patent: Aug. 27, 1985**

[54] **GLOVE FOR LOW PARTICULATE ENVIRONMENT**

[75] Inventors: Steve M. Barnett, Glencoe, Ill.; Michael A. Flowers, Ontario, Calif.; John A. Varos, Willard, Ohio

[73] Assignee: Pioneer Industrial Products Company, Willard, Ohio

[21] Appl. No.: 581,691

[22] Filed: Feb. 21, 1984

[51] Int. Cl.³ A41D 19/00

[52] U.S. Cl. .... 2/164; 2/161 R; 2/168

[58] Field of Search .... 2/164, 158, 159, 161 R, 2/162, 167, 168

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Primary Examiner—Werner H. Schroeder
Assistant Examiner—J. L. Kravitz
Attorney, Agent, or Firm—Marshall, O'Toole, Gerstein, Murray & Bicknell

[57] **ABSTRACT**

A glove for use in a low particulate environment, such as a manufacturing area for electronic equipment, has an external shell composed of polyvinyl chloride or elastomeric material. The external shell has a hand portion and a gauntlet portion. The hand portion is internally lined with flock while the gauntlet portion is unlined.

5 Claims, 2 Drawing Figures

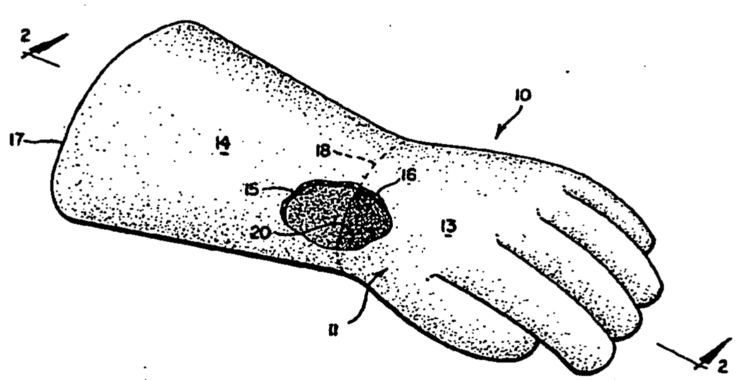


FIG. 1

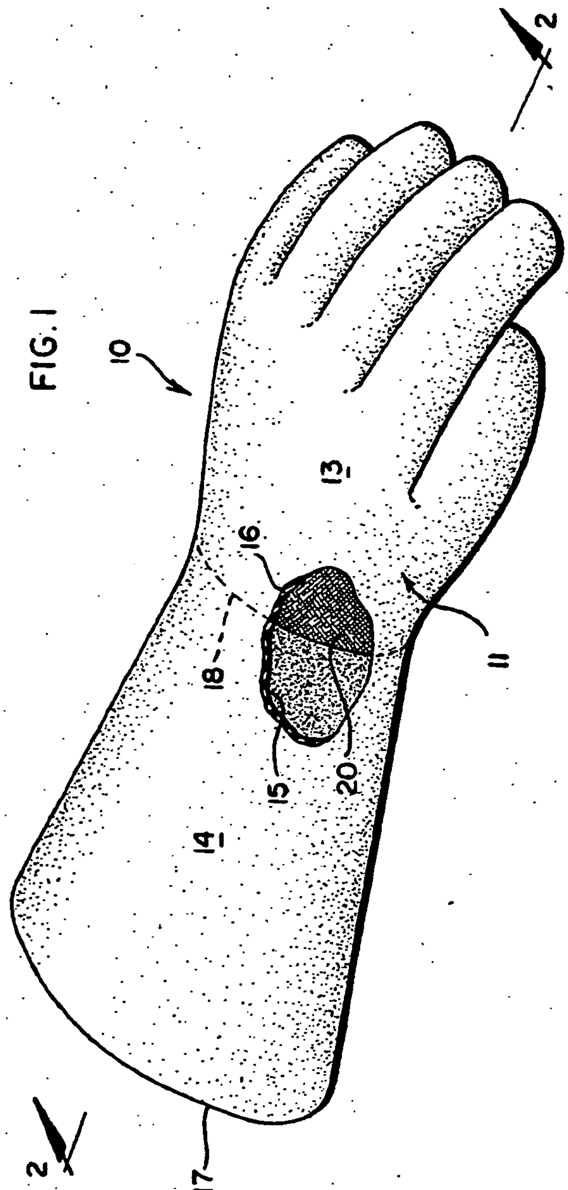
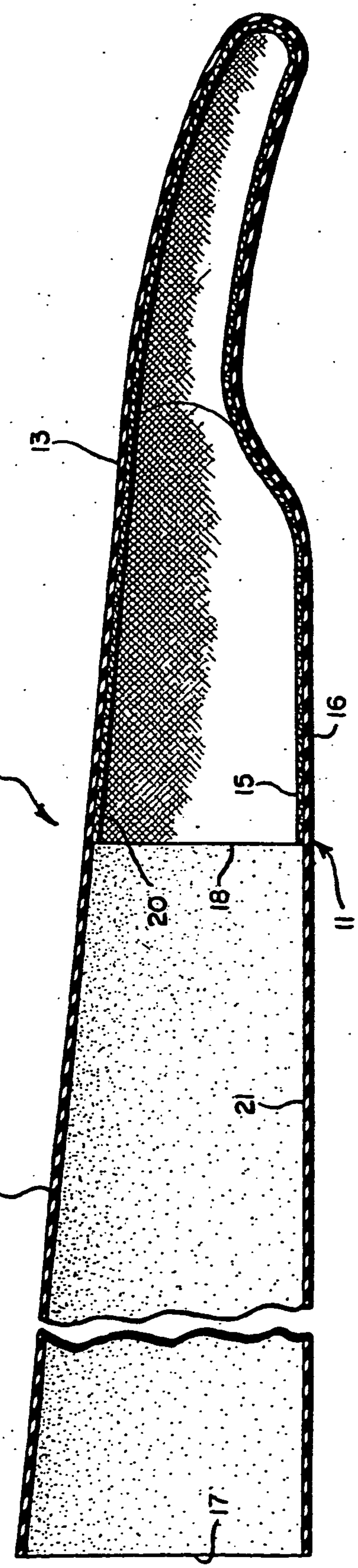


FIG. 2



GLOVE FOR LOW PARTICULATE ENVIRONMENT

BACKGROUND OF THE INVENTION

The present invention relates generally to gloves and more particularly to gloves for use in a low particulate environment.

A low particulate environment is desirable in an area where electronic equipment is manufactured, for example. Manufacturing and assembly workers in such an area generally wear protective garments, such as caps, smocks or gowns and gloves. The glove has an external shell typically composed of polyvinyl chloride (PVC) or elastomeric material such as natural rubber or synthetic rubber. Such gloves are much more acceptable to the workers who must wear them if the gloves have an internal lining composed of fibrous material such as cotton flock. Flock is composed of finely divided, ground, fibrous particles which are applied as a lining by spraying the flock particles onto an adhesive-covered backing (e.g., the external shell of the glove), for example.

An internal glove lining composed of flock provides a smooth, comfortable feel, cushions the hands, absorbs perspiration and keeps the hands dry, insulates against moderate heat and cold without bulk, makes it easier to put on and take off a glove, and has other advantages which increase worker acceptance of a glove.

A drawback to a glove having an internal lining composed of cotton flock (or like fibrous material) is that particles thereof may become detached from the internal lining by abrasion with the surface of the sleeve on the smock or gown worn by the glove wearer or by abrasion with the hand of the glove wearer, and these detached particles can migrate out of the glove, particularly when the glove is removed from the hand of the wearer. In a low particulate environment, such as an assembly area for electronic equipment, migration of detached particles out of the glove is undesirable because it increases the particulate content of the environment.

Elimination of the lining from the glove is not a viable alternative because the glove wearers are reluctant to accept gloves without such an internal lining.

SUMMARY OF THE INVENTION

A glove constructed in accordance with the present invention avoids the problems discussed above. The glove comprises an external shell composed of polyvinyl chloride or elastomeric material. The shell comprises a hand portion for enclosing the hand of a glove wearer and a gauntlet portion for enclosing the wrist and the lower forearm of the glove wearer. An internal lining is attached to the inside surface of the hand portion, only.

The internal lining is composed of textile material, such as cotton flock, from which particles can be detached by abrasion with the surface of the sleeve of an article of clothing worn by the glove wearer. Such abrasion is avoided, however, because the inside surface of the gauntlet portion of the shell is devoid of any lining from which such particles may become detached, and the lining attached to the hand portion of the shell does not abrade against the sleeve.

Although it is possible for flock particles to be otherwise detached from the lining at the hand portion of the shell, these detached particles must migrate the entire

length of the unlined gauntlet portion before they can escape to the outside of the glove, and the gauntlet portion has a length sufficient to minimize the likelihood of such an escape. Because the lining is confined to the hand portion of the external shell, it is less likely that particles will migrate out of the glove than if a larger part or all of the glove were so lined.

The net result is a reduction of approximately 50% in the amount of particles which may enter the environment from a glove in accordance with the present invention, compared to a glove in which the entire external shell has a lining composed of fibrous material such as flock.

Other features and advantages are inherent in the glove claimed and disclosed or will become apparent to those skilled in the art from the following detailed description in conjunction with the accompanying diagrammatic drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective, partially in section and partially cut away, illustrating an embodiment of a glove constructed in accordance with the present invention; and

FIG. 2 is an enlarged sectional view taken along line 2—2 in FIG. 1.

DETAILED DESCRIPTION

Indicated generally at 10 is a glove constructed in accordance with an embodiment of the present invention. Glove 10 comprises an external shell 11 composed of polyvinyl chloride or an elastomeric material such as natural rubber, synthetic rubber, blends of natural and synthetic rubbers or the like.

External shell 11 comprises a hand portion 13 for enclosing the hand of the glove wearer and a gauntlet portion 14 for enclosing the wrist and the lower forearm of the glove wearer. Gauntlet portion 14 extends from an open rear entrance 17 of glove 10 to a location 18 corresoonding substantially to the forward end of the wrist of the glove wearer.

External shell 11 has an inside surface 15 and an outside surface 16. Attached to inside surface 15 of the external shell's hand portion 13 is an internal lining 20. The inside surface of gauntlet portion 14 is devoid of any such lining.

Internal lining 20 is composed of a fibrous material such as flock. The flock may be made from cotton or other natural fibers (e.g., wool or silk), synthetic fibers (e.g., polyester) or a blend of natural and synthetic fibers.

Flock is a material from which particles may become detached by abrasion with the surface of a sleeve of an article of clothing, such as a gown or smock, worn by the glove wearer. This would be a problem in a low particulate environment, but the problem is avoided in accordance with the present invention because the inside surface 21 of gauntlet portion 14 is devoid of any lining from which such particles may become detached.

Moreover gauntlet portion 14 has a length, from location 18, at the forward end of the wrist of a glove wearer, to open rear glove entrance 17 which is sufficient to minimize the likelihood of escape of detached flock particles originating at lining 20 attached to hand portion 13 of external shell 11. More particularly, glove 10 typically has a length of about 14 inches (356 mm), and the gauntlet portion of the glove has a length within

the range 5-7 in. (127-178 mm). Preferably, the gauntlet portion is 6 in. long (152 mm).

Gauntlet portion 14 encloses preferably at least the lower half of the forearm of the glove wearer. If desired, the gauntlet portion may extend further up the forearm. In some embodiments, gauntlet portion 14 may enclose less than the lower half of the forearm so long as the unlined gauntlet portion has sufficient length to substantially impede migration out of the glove of detached flock particles originating at the hand portion of the glove.

Because internal lining 20 is confined to hand portion 13 of external shell 11, there will be no abrasion between lining 20 and the surface of a sleeve on an article of clothing worn by the glove wearer during the time the glove is being put on or taken off. In addition, because the rearwardmost edge 18 of lining 20 is so remote from open rear end 17 of glove 10, it is extremely unlikely that any particles originating at the hand portion 13 would migrate out of the glove through open rear end 17.

When gloves in accordance with the present invention are used, the maximum potential particulate burden of the surrounding environment is reduced by 50% compared to the particulate content of an environment in which are used gloves in which the internal lining is attached to the totality of the inner surface of the external glove shell.

A construction in accordance with the present invention may be employed not only when the internal lining of the glove is flock but in any situation employing an internal lining composed of fibrous material from which particles may become detached by abrasion with the surface of a sleeve on an article of clothing worn by the glove wearer or by abrasion at the hand portion of the glove.

Glove 10 may be manufactured employing a conventional operation for producing a glove having an external elastomeric shell and an internal lining composed of cotton flock, for example. In a typical operation, a form having the shape of the glove is dipped into a liquid coagulant for the elastomeric material which is then allowed to dry on the form which is then dipped into the liquid elastomeric material followed by a leaching operation in a hot water bath to remove from the elastomeric material undesirable, water soluble impurities. The elastomeric-covered form is then allowed to dry following which adhesive is applied to that part of the elastomeric material (e.g., hand portion 13) which is to be lined. Adhesive is applied by dipping the elastomeric-covered form in liquid adhesive up to the location of line 18. Flock is then applied by spraying. The flock will adhere only to that part of the elastomeric material covered with adhesive. The assembly is then subjected to a heating operation to vulcanize the elastomeric material, following which the glove is stripped from the form and inverted. The glove may then be washed to remove any loose flock particles.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

We claim:

1. A glove for use in a low particulate environment, said glove comprising:

an external shell composed of a material selected from the group consisting of polyvinyl chloride and elastomeric materials;

said external shell comprising a hand portion for enclosing the hand of a glove wearer and a gauntlet portion for enclosing the wrist and the lower forearm of the glove wearer;

said external shell having inside and outside surfaces;

and an internal lining attached to the inside surface of said hand portion;

said internal lining being composed of fibrous material, said fibrous material being of a kind from which particles may become detached if there were abrasion between said material and the surface of a sleeve on an article of clothing worn by the glove wearer;

the inside surface of said gauntlet portion being devoid of any lining from which said particle may become detached.

2. A glove as recited in claim 1 wherein:

said lining is composed of flock made from the group consisting of natural fibers, synthetic fibers and blends thereof.

3. A glove as recited in claim 1 wherein:

said gauntlet portion has a length which minimizes the likelihood of escape of detached particles originating at the lining attached to the hand portion of said external shell.

4. A glove as recited in claim 3 wherein:

said gauntlet portion has a length within the range 5-7 inches (127-178 mm).

5. A glove as recited in claim 1 wherein:

said gauntlet portion extends from an open rear entrance of the glove, corresponding to a location at least halfway up the forearm of a glove wearer, to a location corresponding substantially to the forward end of the wrist of a glove wearer so as to substantially impede migration out of the glove of detached lining particles originating at the lining attached to the hand portion of said external shell.

* * * * *

APPENDIX F

September 19, 2002 Declaration of Nestor Kolcio

Attorney Docket No.: UPI 2-001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	)	
Nestor Kolcio, et al.	)	
Serial No.09/954,788	)	Examiner Katherine M. Moran
Filed: September 18, 2001	)	Group Art Unit 3765
For: "Method for Accessing Electrical Components with Gloved Hands"	))	

COMMISSIONER OF PATENTS
WASHINGTON, D.C. 20231

DECLARATION UNDER 37 CFR 1.132

Nestor Kolcio declares as follows:

1) That he is a citizen of the United States of America and has a residence at 11500 Jerome Road, Plain City, Ohio 43064;

2) That he is an inventor named in the above-identified application for United States patent;

3) That he has been professionally involved in the subject matter of power generation technology including high voltage practices, insulation coordination, and the development of international standards with respect to such matters for over forty years;

4) That his general resume outlining his professional experience is annexed hereto as Exhibit A;

5) That his resume with respect to professional experience related to personal protective equipment in the electric power industry is annexed hereto as Exhibit B;

6) That he has been advised that claims 1, 6-8, 13 and 14 of the above-identified application have been rejected under § 103(a) of the Patent Statute as being unpatentable over Barnett, et al., U. S. Patent No. 4,536,890 (hereinafter Barnett, et al.);

7) That in applying the rejection the Examiner has stated that Barnett, et al., teaches a method of using a rubber, insulating glove with a non-conductive adhesively retained flock for accessing low voltage electrical components;

8) That he has reviewed Barnett, et al., and observes that the patent describes a glove intended for use in the assembly of electronic equipment in a clean room environment;

9) That Barnett, et al., does not describe the glove 10 as being insulating and does not describe the utilization of a non-conductive adhesively retained flock;

10) That claim 1 describes the provision of a tightly fitting rubber insulating glove which is not described in Barnett, et al.;

11) That claim 1 describes a lining of the glove with a non-conductive adhesively retained flock effective to facilitate removal of the glove from the hand;

12) That Barnett, et al., describes a manufacturing environment for use of a glove wherein the glove would not be removed;

13) That Barnett, et al., teaches a glove structuring which is not intended to be removed and which is intended to be comfortable so as to avoid glove removal from the hand, whereas claim 1 describes a step of periodically removing the glove from the gloved hand to cool and remove moisture from the hand and glove;

14) That Barnett, et al., does not teach nor suggest the utilization of a glove which, in the first instance, because of its necessary electrical insulative qualities will be uncomfortable and will be removed by the user;

15) That he is advised that the Examiner has indicated that it would have been obvious at the time of the invention to use the glove of Barnett, et al., for accessing electrical components energized at voltages of less than about 500 volts rms or less than about 1000 volts rms to assure maximum protection;

16) That Barnett, et al., inter alia, does not suggest the utilization of the glove described therein for accessing higher voltage electrical equipment;

17) That Barnett, et al., describes a polyvinyl chloride material as a possible glove material, a material not suitable for achieving requisite electrical insulation quality;

19) That Barnett, et al., does not suggest a method employing an electrically insulative tight fitting glove;

21) That he has been advised that claims 2-5, and 9-12 have been rejected under §103(a) of the Patent Statute as being unpatentable over Barnett, et al., in view of Ganz, U. S. Patent No. 3,883,899 (hereinafter "Ganz");

22) That in applying this rejection, he has been advised that the Examiner has stated that Ganz teaches a rubber glove with ridges on an exterior inward fingertip and palm region for enhancing, gripping and tactile properties;

24) That he has reviewed Ganz and observes that the glove described therein is not insulating with respect to work on an electrical system;

25) That he has observed that the type of roughening taught by Ganz is to create craters with ridges about those craters a form of roughening which, for the claimed method at hand, would collect contaminates from the equipment being worked on;

26) That the craters formed in the Ganz glove will retain dirt-like contaminates and defeat the necessary dieletctric strength of the gloves for the method claimed;

27) That the ridge technique for roughening the fingertip regions as now claimed do not detract from the dielectric strength of the gloves by reducing their thicknesses as represented in Ganz;

28) That the surgical gloves described in Ganz are not intended to be removed from the hand in the course of their intended use;

29) That in contrast, the claimed method anticipates that the gloves will be removed in the course of their use in accessing electrical equipment held at higher voltages;

30) That it is his considered opinion that the combination of Ganz with Barnett, et al., would not suggest the method taught and claimed in the instant application; and

31) That all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like, so made, are punishable by fine, or imprisonment, or both, under § 1001 of Title 18, and that such willful false statements may jeopardize the validity of the application or any document resulting therefrom.

Further Declarant sayeth naught.

Date Sep 19, 2002

Nestor Kolcio

EXHIBIT A

RESUME

NESTOR KOLCIO, PE

EDUCATION:

BSEE - West Virginia Institute of Technology, 1962. Postgraduate courses in EE - Columbia University, New York, NY 1963-64. Power Technology Course, PTI, NYCity, 1971-74. Professional Engineer, CA license No. SF 2204

EXPERIENCE

Present: Senior Consultant, 2K Consultants, Inc.. One of the founders of 2 KCI. The Company provides consulting services to the electronics and electric power industry. Mr. Kolcio consults in the areas of: maintenance engineering, safety rules and practices, insulation coordination, high voltage practices, standards and regulations, and litigations.

Present: President Kub Electronics Inc.. One of the founders of Kub Electronics Inc.. The Company is dedicated to provide engineering and high technical services to commercial customers, federal and state agencies.

1989 -
2000

AEP. Mr Kolcio became Principal Engineer in the Electrical Research Section of the Research and Equipment Division with responsibilities to consult and supervise work dealing with Safety Practices, Electrical Maintenance Engineering, High Voltage practices related to electric field and corona effects and insulation coordination. He has been consulting to the AEP Service Corporation and the former AEP Operating Companies on the above subjects. As a member of the System Safety Manual Revision Committee, he is involved in review and comment on the electrical aspects of safety rules, work practices and accident reports. In the area of maintenance engineering, Mr. Kolcio has been leading a research and development effort to design new tools and cover-up equipment for live line work. This has resulted in promoting and issuing guidelines for electrical tests and operating procedures dealing with insulated aerial lifts, live line tools and protective equipment.
Mr. Kolcio has helped a former AEP Operating Company by providing testimony on high voltage corona and electric field effects during rights-of-way easement litigation. Also, as an AEP representative, he has testified for EEI on clearances during Public Hearings on OSHA's proposed "Maintenance Standard".
Mr. Kolcio serves as an IEEE PES representative on ANSI C63 Committee " Electromagnetic Compatibility" (EMC) and is a member of US Advisory Group on IEC TC 77 Committee "Electromagnetic Compatibility Between Electrical Equipment Including Networks". Both

ANSI and IEC committees are preparing and issuing standards on testing and measurements (including limits) of EMC.

1976 - 1988

AEP . As a Senior Electrical Research Engineer, Mr. Kolcio's responsibility was to conduct work related to: a) Safety b) Electrical Maintenance Engineering
c) HigVoltage Practices Related to Electric Field and Corona Effects d) Insulation Coordination - Electrical Stresses
He was responsible for issuing 765kV Guidelines for Supervisory Personnel, Aerial Lift Procedure Manual, Revision of the Electrical Section of the AEP Safety Manual. N. Kolcio has initiated and coordinated the design and application of Field Recording Stations (RI, TVI and AN; 1969-1982). As Chairman of AEP's IPE Task
Force, he was responsible for coordinating work on engineering safety considerations related to live line maintenance on 34.5kV and other distribution voltages. N. Kolcio made numerous lectures and presentations on topics related to electrical aspects of safety and maintenance practices before transmission and distribution personnel of the former AEP Operating Companies. Conducted work (1977-84) with the University of Western Ontario related to the psychoacoustics of corona noise from transmission lines.
N. Kolcio has worked on and has issued guidelines for testing of insulating protective equipment, such as insulating gloves, sleeves, blankets, line guards, line hoses, insulating footwear and other. . He was obtained a U. S. patent on testing of insulating gloves and another U. S. patent for design of protective cover-up for 69 kV work. In 1988, he was responsible for organizing and conducting field tests and overcurrents on a 14.kV distribution lines. He has served as an Advisor to National Standards Institute on studies related to psychoacoustics of corona noise. As a chairman of IEEE Radio Noise and Corona Subcommittee for seven years, Mr. Kolcio coordinated work (field and laboratory studies) leading to several IEEE standards on radio noise, corona loss, TVI, and audible noise generated from EHV lines and equipment.

1965 - 1976

AEP. As an Electrical Research Engineer, Mr. Kolcio's responsibilities were to conduct R&D investigations on subjects related to safety, live line maintenance and corona effects. Between 1962-1976, he was AEP's coordinating engineer at the Apple Grove 750 kV Test Research Project. There, Mr. Kolcio initiated and coordinated a series of studies on the effects of corona (RI, TVI, Corona Loss and AN). These studies led to the design of the first 500 kV and 765 kV lines in the U. S.

1962 - 1965

AEP As an Associate Electrical Engineer, Mr. Kolcio assisted and participated in a number of research projects related to the development of live line maintenance methods, insulation coordination of 765 kV lines, and corona effects up to 765 kV level. He has received an AEP award for his work in developing the "barehand" live line maintenance method.

AWARDS

1)IEEE
IEEE Fellow "for contributing to safety in live line work, and corona performance of overhead lines" 1992; Certificate of Appreciation,1978,- chairman Radio Noise and Corona Subcommittee; Working Group Recognition Award, 1987; PES Working Group Recognition Award for Outstanding Technical Report, 1993.
2)AEP
a)1965 AEP award for developing the "barehand live line maintenance method".
b)1986 AEP award for development of test method for insulating gloves

PROFESSION AFFILIATIONS:

I. IEEE - Power Engineering Society - LIFE FELLOW of IEEE
A) Transmission and Distribution Committee - Member since 1970
1)
T&D Administrative Subcommittee - Member 1975-86
WG "Coordination of Environment, Safety and Public Affairs" -Chairman 1977-86
2)
Corona and Electric Field Subcommittee (Formerly Radio Noise and Corona Subcommittee) - Member since 1965. Chairman 1970-1977
WG # 1 - "AC Lines" - Chairman 1965 - 1970
WG # 2 - "Instrumentation and Measurements" - Member 1967 - 76
WG #3 - "Line Design and Analysis " - Member 1970 - 76
WG on Corona Effects - Member 1970 - 80
WG on Design & Environmental Consideration - Member
3)
"Live Line Maintenance Task Force," T, P&C subcommittee - Member 1967 - 1975
4)
Engineering in Safety, Maintenance and Operation of Lines Subcommittee (ESMOL) - Founding Member since 1975
WG " Analytical Considerations," ESMOL Subcommittee - Chairman 1976 - 86
Special Task Force on "Guide for Maintenance Methods on Energized Power Lines" - Member
B
PES Public Affair Subcommittee - T&D Representative Member 1979 - 87

II.
American National Standard Institute, Committee C63, "Electromagnetic Compatibility" - Member since 1977
A)
Subcommittee # 1 - Techniques and Development - Member since 1977
B)

Subcommittee # 2 - RIV Techniques - member since 1973

III.
CIGRE Study Committee 36 "Interference"
WG # 1 - "Corona and Fields" - Member 1970 - 86

IV.
International Electrotechnical Commission (IEC)
A)
IEC- Technical Committee 78 "Tools for Live Working"
U.S. Technical Advisor 1976 - 1984
- Member U.S. Advisory Group since 1976
- Member WG #3 "Protective Equipment"
- U.S. Member Expert to WG #3, 1987 -
- Reporter (Chairman) of a "Special Working Group on Dielectric Testing," 1989 - 94
B)
IEC - Technical Committee 77 Electromagnetic Compatibility Between Electrical Equipment Including Networks" - Member of U. S. Advisory Group since 1977

V. IEC/CISPR (International Special Committee on Radio Interference) Subcommittee C, " "Interference from Overhead Power Lines, High Voltage Equipment and Electric Traction Systems" - Member of U.S. Advisory Group since 1977

VI.
Edison Electric Institute (EEI)
A)
Transmission and Distribution Committee
- "Ad Hoc Committee on Live Line Maintenance" Member 1976 - 1978
- EEI-OSHA Task Force
Worked with this group on items related to the proposed OSHA Maintenance Standard. Testified on clearances during OSHA Hearings on Maintenance Standard, Washington, D. C., December 3-4, 1989.
B)
Standards Committee EEI Technical Contact 1983 - 86 to: IEC TC - 78 , IEC TC - 77 CIGRE 36, ANSI - C63 & CISPR Subcommittee C.

VII.
American Society for Testing and Materials (ASTM) - Member since 1988 .
- Member of ASTM-F18 Committee "Electrical Protective Equipment for Workers". Chairman of Task Force F-18.35.22 "Protective Shields/Barriers on Live Line Tools to Protect Workers From Electric Arc Thermo and Fragmentation Pressure Wave Blast"

PUBLICATIONS:

A)
IEEE - ANSI

1)
E. R. Taylor, Jr., N. Kolcio and W. E. Pakala, "The Apple Grove 750 kV Project - 775 kV Radio Influence and Corona Loss Investigation," IEEE Trans. Power Apparatus and Systems, Vol. PAS-84, pp. 573-579, July, 1965.

2)
E. R. Taylor, Jr., W. E. Pakala and N. Kolcio, "The Apple Grove 750 kV Project - 515 kV Radio Influence and Corona Loss Investigation," IEEE Trans. Power Apparatus and Systems, Vol. PAS-84, pp. 561-573, July, 1965.

3)
N. Kolcio, V. Caleca, S. J. Marmaroff and W. L. Gregory, "Radio Noise and Corona Loss Aspects of AEP 765 kV Lines," IEEE Trans. Power Apparatus and Systems, Vol. PAS-88, pp. 1343-1355, September, 1969. The data presented and analyzed in this paper were the main basis used by AEP in selecting a conductor arrangement for its 765 kV system.

4)
V. L. Chartier, D. F. Shankle and N. Kolcio, "The Apple Grove 750-kV Project: Statistical Analysis of Radio Influence and Corona-Loss Performance of onductors at 775-kV, "IEEE Trans. Power Apparatus and Systems, Vol.

PAS-89, No. 5, pp. 867-881, May/June, 1970.
5)
N. Kolcio, "EHV Transmission Line corona Effects - Part IV - Audible Noise, "

IEEE Tutorial Course, 72-CHO-6445-PWR, 1972. A comprehensive description

of audible noise from transmission lines.
6)
Audible Noise Task Force of the Radio Noise Subcommittee of the IEEE t&D

Committee, "A Guide for the Measurement of Audible Noise from Transmission

Lines," IEEE Trans. Power Apparatus and Systems, Vol. PAS-91, pp. 853-856,
May/June, 1972. N. Kolcio chaired the Subcommittee and
contributed to the paper.
7)
IEEE Committee Report, N. Kolcio and Task Force, "Live Line Maintenance

Methods," IEEE Trans. Power Apparatus and systems, Vol. PAS-92, pp.

1042-1048, September/October, 1973. N. Kolcio was the leading author of this

publication which presented a basis from which working clearances and methods

can be developed.
8)
C. W. Juette and Task Force (including N. Kolcio), "Comparison of Radio Noise

Prediction Methods With CIGRE/IEEE Survey Results," IEEE Trans. Power

Apparatus and Systems, Vol. PAS-92, No.3, pp. 1029-1042, May/June, 1973. N.

Kolcio was the initiator of the survey and contributed to the paper.
9)
N. Kolcio, B. J. Ware, R. L. Zagier, V. L. Chartier and F. M. Dietrich, "The Apple Grove 750 kV Project Statistical Analysis of Audible Noise Performance of Conductors at 775 kV," IEEE Trans. Power Apparatus and Systems, Vol. PAS-93, pp. 831-840, May/June, 1974.
10)
N. Kolcio, "Power Line Noise as Related to Psychoacoustics," Part 3. "Psychoacoustics," IEEE Special Publication 74-CHO-967-O-PWR. N. Kolcio was the initiator and the coordinator of the workshop.
11)
N. Kolcio and Task Force, "Audible Noise from Power Lines - Measurement, Legislative Control and Human Response," IEEE Trans. Power Apparatus and Systems, Vol. PAS-94, No. 6, pp. 2042-2048, November/December, 1975. N. Kolcio was a coauthor of the paper and coordinated the work on paper preparation.
12)
IEEE Standard, "IEEE Standard Procedures for the Measurement of Radio Noise from Overhead Power Lines," IEEE Standard 430, 1976. N. Kolcio chaired the

Subcommittee and spearheaded the work on the Standard.
13)
N. Kolcio, J. Diplacido and F. M. Dietrich, "Apple Grove 750-kV Project Two Year Statistical Analysis of Audible Noise from Conductors at 775-kV and Ambient Noise," IEEE Trans. Power Systems Apparatus and Systems, Vol. PAS-96, No. 2, pp. 560-570, March/April, 1977. This paper was the first in the world to present audible noise data from full scale 3-phase test lines.
14)
N. Kolcio, J. Diplacido, R. J. Hass and D. K. Nichols, "Long Term Audible Noise and Radio Noise Performance of American Electric Power's Operating 765kV Lines," IEEE Trans. on Power Apparatus and Systems, Vol. PAS-98, No. 6, November/December, 1979.
15)
ANSI Standard, "Specification for Electromagnetic Noise and Field Strength Instrumentation 10 kHz-1 GHz, " ANSI C63.2, 1980. N. Kolcio, IEEE PES Representative, contributed to the preparation of the Standard.
16)
E. A. Cherney, K. G. Ringler, N. Kolcio and G. K. Bell, "Step and Touch Potentials at Faulted Transmission Tower," IEEE Trans. Power Apparatus Systems, Vol. PAS-7, July, 1981, pp. 3312-3321. N. Kolcio organized and

conducted the tests and coauthored the paper.
17)
IEEE Committee Report, "Qualification Testing of Insulated Aerial Devices Rated 69 kV and Below," IEEE Trans. Power Apparatus Systems, Vol. PAS-101, No. 6, June, 1982. N. Kolcio chaired the IEEE Working Group and was the lead author.
18)
N. Kolcio and R. A. Peszlen, "Electrical Aspects of Testing Insulating Gloves," IEEE Trans. Power Apparatus Systems, Vol. PAS-102, No. 7, July, 1983, pp. 2364-2368.
19)
N. Kolcio and R. A. Peszlen, "Humitidy Effects and Breakdown Characteristics of Class II Insulating Gloves," IEEE Trans. Power Apparatus Systems, Vol. PAS-103, No. 8, August, 1984.
20)
N. Kolcio, "Field Measurements of Leakage Current in Insulating Gloves," IEEE Trans. Power Apparatus Systems, Vol. PAS.-104, No. 9, September, 1985.
21)
"IEEE Guide for Maintenance Methods on Energized Power Lines," ANSI/IEEE Standard 516-1987. N. Kolcio was a member of a Task Group responsible for preparation of the Standard. Initially he chaired a group with prepared Section 3,

"Technical Consideration and Testing."
22)
Committee Report, "IEEE Guide on Terminology for Tools and Equipment to be Used in Live Line Working," ANSI/IEEE Std. 935-1989. N. Kolcio is a member of the Definition Working Group instrumental in the preparation of the Standard.

23)
N. Kolcio, Discussion of "Test Results of Personal Protective Grounding on Distribution Line Wood Pole Construction," by J. T. Bowner, B. Erga, W. W. Gibles and V.M. Gregorius, Discussion published in IEEE Trans. on Power Delivery, Vol. 4, No. 2, April, 1989.
24)
A. Nourai and N. Kolcio, "Electrical Testing of Insulated Aerial Lifts for Contamination Using Capacitive Current Compensation Technique," IEEE Transactions Power Delivery Apr. 1990 Vols. No. 2 (ISSN 0885-8977).
25)
N. Kolcio, J. A. Halladay, G. D. Allen, E. N. Fromholtz "Transient Overvoltaages and Overcurrents on 12.47 kV Distribution Lines: Field Test Results," IEEE Transactions on Power Delivery, July, 1992, Vol. 7, No. 3, ITPDE 5.
26)
N. Kolcio, J. A. Halladay, G. D. Allen, E. N. Fromholtz "Transient Overvoltages and Overcurrents on 12.47 kV Distribution Lines: Computer Modeling Results,"

IEEE Transaction Paper presented during 1992 Winter Power Meeting. New York City, 92 WPM 273-3 PWRD.

27)
G. Gela, N. Kolcio and Task Force 15.07.03.02 members of IEEE, PES - T&D ESMOL Subcommittee "Correlation of AC, switching surge and DC Breakdown Test Results For Insulating Blankets and Line Hoses" IEEE Transaction Paper, 91 SM 502-5 PWRD.

28)
J. A. Barsch, S. A. Sebo, N. Kolcio "Power Frequency AC Sparkover Voltage Measurements of Small Air Gaps" submitted to IEEE, May 1998.

29)
IEEE Guide "IEEE Guide For Installation, Maintenance and Operation of Irrigation Equipment Located Near or Under Power Lines". The gide was prepared by PES, T&D, C&EF Taskforce chaired by N. Kolcio, 1997.

B)
CIGRE

1)
N. Kolcio and C. H. Shih, Discussion on CIGRE Paper 23-06 - 1972, "Influence of the Electric Field in 500 and 750 kV Switchyards on Maintenance Staff and

Means for Its Protection," by V. P. Korogkova, et al. The discussion presents

AEP's experience with electric field effects from 345 kV and 765 kV lines.

2)
Committee Report, "Interference Produced by Corona Effects of Electric

Systems," Description of phenomena and practical guide for calculations, CIGRE,

1974. CIGRE Committee 36, Working Group 01. N. Kolcio as the USA

representative coauthored the report.

3)
F. M. Dietrich and N. Kolcio, "Corona Electric Field Effects at the Apple Grove

Project and in 800-kV Line in the USA," CIGRE No. 31-08, 1976.

C)
IEC (International Electrotechnical Commission)

N. Kolcio, "Harmonization of Test Voltages for Live Working Tools and Equipment,"

U. S. National committee to IEC Position Paper TC-78, "Tools for Live Working".

Prepared for General Meeting held in Dubrovnik, Yogoslavia, April 13-14, 1989.

D)
Other Publications

1)
J. A. Barsch, S. A. Sebo, N. Kolcio "Partial and Full Breakdown of Various

Electrodes at AC in Small Air Gaps", International Conference on Dielectrics and

Insulation 10-13, September 1997, Budapest, Hungary.
2)
T. Rao, N. Kolcio "Guidelines For Installation and Maintenance of Irrigation

Equipment Near Power Lines", ASAE, June 19, 1994, Kansas City, Missouri,

Paper No. 943012.

E)
Trade Magazines

1)
H. L. Rordon and N. Kolcio, "First 765 kV Line Scheduled for Live Line

Maintenance, "Electric Light and Power, April, 1967.
2)
Kolcio, "Accurate Data Essential for Reducing RI and TVI," Electrical World,

January 1, 1975, p. 45. Part of E.W. Engineer's Forum. The article lists methods

and procedures for RI and TVI measurements.
3)
A. Nourai and N. Kolcio, "Resistive Leakage Defines Aerial-Lift Contamination,"

Electrical World, October, 1989.
4)
N. Kolcio, "Insulation Requirements Revised for LV Work" Transmission and

Distribution World, February, 1997.

U. S. PATENTS

Mr. N. Kolcio holds the following U. S. patents:
1) U. S. Patent No. 4,583,039 Electrical Testing Device for Insulating Gloves April 15, 1986

2) U. S. Patent No. 4,628, 145 Protective Cover for Electrical Conductors, December 9, 1986

EXHIBIT B

NESTOR KOLCIO, P. E.

11500 Jerome Road
Plain City, OH 43064
(614) 873-6473
E-mail: nkolcio@att.net

SUMMARY

Professional Engineer with 40 years' experience in maintenance engineering, safety, high voltage practices, insulation coordination, national, and international standards.

In the area of **personal protective equipment**, such as insulating rubber gloves, sleeves, blankets, line hoses, line guards, insulating footwear, and other, Mr. Kolcio conducted research, published technical papers, conducted technical seminars and lectures, prepared safety rules and issued work guidelines. He is a member of several technical and scientific societies, as well as national and international standards organizations.

PROFESSIONAL EXPERIENCE
Related to
Personal Protective Equipment

1. AMERICAN ELECTRIC POWER, Columbus, OH **1962-2000**

Principal Engineer

Consulted with AEP operating companies on maintenance, engineering, safety, insulation coordination and national and international standards related to personal protective equipment. He investigated accidents dealing with rubber gloves and other personal protective equipment and issued special technical reports. In the case of rubber gloves, he chaired special task forces and issued a number of reports and guidelines and was responsible for introducing to AEP operating companies:

A. Insulating Gloves (Class 4), in-service testing and work practices for live working at 36 kV
B. Insulating Gloves (Class 0 and Class 00), in-service testing and work practices for live working at 1 kV and below.
C. Guidelines for use of Class 00 gloves in power plants and substations.

Publications related to insulating rubber gloves:

.N. Kolcio and R. A. Peszlen, "Electrical Aspects of Testing Insulating Gloves," IEEE Trans. Power Apparatus Systems, Vol. PAS-102, No. 7, July, 1983, pp. 2364-2368.

N. Kolcio and R. A. Peszlen, "Humitidy Effects and Breakdown Characteristics of Class II Insulating Gloves," IEEE Trans. Power Apparatus Systems, Vol. PAS-103, No. 8, August, 1984.

N. Kolcio, "Field Measurements of Leakage Current in Insulating Gloves," IEEE Trans. Power Apparatus Systems, Vol. PAS.-104, No. 9, September, 1985.

"IEEE Guide for Maintenance Methods on Energized Power Lines," ANSI/IEEE Standard 516-1987. N. Kolcio was a member of a Task Group responsible for preparation of the Standard. Initially he chaired a group with prepared Section 3, "Technical Consideration and Testing."

N. Kolcio, "Harmonization of Test Voltages for Live Working Tools and Equipment," U. S. National committee to IEC Position Paper TC-78, "Tools for Live Working". Prepared for General Meeting held in Dubrovnik, Yogoslavia, April 13-14, 1989. Presentation included study of glove classification and test requirements.

N. Kolcio, "Insulation Requirements Revised for LV Work" Transmission and Distribution World, February, 1997.

U. S. PATENTS

Mr. N. Kolcio holds the following U. S. patents:
U. S. Patent No. 4,583,039 Electrical Testing Device for Insulating Gloves April 15, 1986
U. S. Patent No. 4,628, 145 Protective Cover for Electrical Conductors, December 9, 1986

2. Electric Power Research Institute (EPRI) Project on Injection Molded Insulating Gloves. **1992-2000**

Mr. Kolcio consulted for EPRI as an industry expert. He planned and conducted technical investigations, prepared reports and made presentations before AEP and EPRI Management.

3. Electric Power Research Institute (EPRI) Project on Live Working on DC Lines Operating Less Than 60 kV DC **2001-2002**

Mr. Kolcio consulted for EPRI as an industry expert. He prepared a report that included the use and testing of insulating gloves from 50V to 47 kV DC.

4. PROFESSION AFFILIATIONS related to work on insulating gloves:

IEEE - Power Engineering Society - LIFE FELLOW of IEEE
Transmission and Distribution Committee - Member since 1970
WG "Coordination of Environment, Safety and Public Affairs" -Chairman 1977-86
"Live Line Maintenance Task Force," T, P&C subcommittee - Member 1967 - 1975
Engineering in Safety, Maintenance and Operation of Lines Subcommittee (ESMOL) - Founding Member since 1975
WG " Analytical Considerations," ESMOL Subcommittee - Chairman 1976 - 86
Special Task Force on "Guide for Maintenance Methods on Energized Power Lines" - Member

International Electrotechnical Commission (IEC)
IEC- Technical Committee 78 ***"Tools for Live Working"***

- Member U.S. Advisory Group since 1976
- Member WG #3 "Protective Equipment" (includes insulating gloves)
- U.S. Expert to WG #3, since1987 -
- Reporter (Chairman) of a "Special Working Group on Dielectric Testing," 1989 - 94

American Society for Testing and Materials (ASTM) - Member since 1988 .

- Member of ASTM-F18 Committee. Mr, Kolcio prepared revisions to standards : ASTM D120 –95 "Standard Specifications for Rubber Insulating Gloves", ASTM F 496 –01 "Standard Specifications for In- Service Care of Insulating Gloves and Sleeves", and ASTM F1236-96 "Standard Guide for Visual Inspection of Electrical Protective Rubber Products".

INTERNATIONAL ELECTROTECHNICAL COMMISSION
US Technical Advisor 1976-1984

Organized and coordinated U.S. Industry responses to international standards to IEC-TC78, "Live Line Working" (includes standards on insulating gloves). Organized and lead U.S. Advisory Group during International Meetings.

5. EDUCATION
Power Technology Course – Power Technology I Certified
Columbia University, New York City, NY
Graduate work in Power
West Virginia Institute of Technology, Montgomery, WV
Bachelor of Science in electrical Engineering

6. CERTIFICATIONS
Professional Engineer License

7. PUBLICATIONS AND PROFESSIONAL ACTIVITIES
Life Fellow, Institute of Electrical and Electronic Engineers – Power Engineering Society
American Society of testing and Material F18 Committee
IEEE PES Representative on American National Standards (ANS) C63 Committee
Authored and co-authored over 37 IEEE Papers and other publications

8. PERSONAL DEVELOPMENT
Completed course "Owner of the Business"

NOTE : *For further information, please refer to Mr. Nestor Kolcio, PE complete Resume.*

APPENDIX G

February 27, 2003 Declaration of Nest r Kolcio

Attorney Docket No.: UPI 2-001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	)	
Nestor Kolcio, et al.	)	
Serial No.09/954,788	)	Examiner Katherine M. Moran
Filed: September 18, 2001	)	Group Art Unit 3765
For: "Method for Accessing Electrical Components with Gloved Hands"	))	

COMMISSIONER OF PATENTS
WASHINGTON, D.C. 20231

<u>DECLARATION UNDER 37 CFR 1.132</u>

Nestor Kolcio declares as follows:

1) That he is a citizen of the United States of America and has a residence at 11500 Jerome Road, Plain City, Ohio 43064;
2) That he is an inventor named in the above-identified application for United States patent;
3) That his education and professional experience with power generation technology are as set forth in his September 19, 2002 declaration, including the exhibits attached thereto, that was filed in connection with the above-identified application;
4) That he has been advised that claims 1-6 and 8-13 of the above-identified application have been rejected under § 103(a) of the Patent Statute as being unpatentable over Hutchinson-Mapa, French Patent No. 2,448,307 (hereinafter, "Hutchinson") in view of Daum et al., U.S. 2002/0075232 (hereinafter, "Daum et al.");
5) That in applying the rejection, the Examiner has stated that Hutchinson discloses method steps inherent in the structure of a rubber, tight-fitting, and insulative electrician's glove with a non-conductive, adhesively-retained flock lining on at least a palm and back interior and the initial joint glove regions, for accessing low-voltage electrical components;
6) That he has reviewed Hutchinson and observes that the patent describes a glove that is structurally different from that disclosed for use with the method of the present invention;
7) That the Hutchinson glove is intended to be electrically protective, resistive to chemical aggression agents, and thermally insulative;
8) That to perform these functions, the glove is described as combining what were previously three gloves into a single one;

9) That Hutchinson describes a glove including a heavy layer made of synthetic elastomer for resistance to chemical aggression agents, a middle layer having extensive dielectric properties, and an internal layer having thermal insulation properties;

10) That the method disclosed in Hutchinson for manufacturing the glove is different from that of the present invention, in that the method of Hutchinson includes the steps of providing a mold in the shape of a hand, forming the exterior layer by dipping the mold in a synthetic elastomer, forming the middle layer by dipping the mold and first layer in an elastomer having dielectric properties, forming the interior layer of textile fibers by flocking, and removing the glove from the mold and reversing it;

11) That the thermal insulative layer of the Hutchinson glove is intended to provide warmth and covers the entire middle layer of elastomer as opposed to covering select portions;

12) That he is aware of a glove manufactured by Hutchinson-Mapa that he believes is manufactured in accordance with the teachings of the Hutchinson patent;

13) That because the exterior layer of the Hutchinson glove is relatively heavy, rigid, and stiff, it does not permit sufficient finger dexterity to effectively maneuver small electrical system components such as washers, bolts, nuts, etc.;

14) That the Hutchinson-Mapa glove does not meet the ASTM Standard Specification for Rubber Insulating Gloves;

15) That the method of the present invention is for accessing electrical components energized at voltages of about 1000 volts rms and below and that for specified lower voltage ranges, a rubber-type insulating glove may be utilized without an outer leather protector glove or other protective layer;

16) That for relatively low voltage environments, it is important that an electrician have sufficient dexterity to manipulate small electrical components;

17) That because of the sweat-based moisture buildup that occurs quickly when wearing an electrically protective glove, he recognized that rather than trying to make a glove that was cooler and could be worn longer, it was important that a glove that is easy to take on and off;

18) That he recognized that making a glove easy to put on and take off could be achieved by providing a flocking layer but that a flocking layer on the interior of the glove would diminish the electrician's dexterity;

19) That he recognized that by partially lining the interior of a glove, for example, on only the palm and back of the hand leaving the finger tip regions free from flocking, the glove simultaneously could provide electrical protection, the necessary dexterity to manipulate small components but would still be easy to remove;

20) That using the present method, these advantages could be realized with a Class 00 or Class 0 glove meeting the ASTM Standard Specification for Rubber Insulating Gloves;

21) That the flock lined gloves of the present method are formed by spraying non-conducting adhesive born flock through the cuff opening of an unreversed Class 00 and/or Class 0 glove;

22) That in applying the rejection, the Examiner has stated that Daum et al. teaches a rubber glove which produces a build up of sweat inside the glove and that as a result it is common for users to take a rest from using the glove;

23) That the description cited by the Examiner refers to prior art gloves formed of heavy rubber and that the solution of Daum et al, is not to make a glove that is easy to take on and off, but rather to make a glove that can be used for prolonged duration;

24) That he believes that his invention is patentable over Hutchinson, Daum, and the combination of Hutchinson and Daum; and

25) That all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like, so made, are punishable by fine, or imprisonment, or both, under § 1001 of Title 18, and that such willful false statements may jeopardize the validity of the application or any document resulting therefrom.

Further Declarant sayeth naught.

Date Feb 27 2003

Nestor Kolcio